Department of Energy
Office of Legacy Management

October 28, 2008

Mr. Carl Spreng
Rocky Flats Cleanup Agreement Project Coordinator
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

SUBJECT: Original Landfill Seep West Perimeter Channel Stabilization Design Dated October 24, 2008, and Tetra Tech West Perimeter Channel Slope Stability Analysis for the Design, Calculation No. 2, Revision B, and Tetra Tech West Perimeter Hydraulics Analysis for the Design, Calculation No. 1

Dear Mr. Spreng:

This correspondence is to transmit the enclosed subject perimeter channel design drawings for Colorado Department of Public Health and Environment review and approval. Per your request, we are forwarding a copy of this letter and the enclosures to Vera Moritz, U.S. Environmental Protection Agency, Region 8.

Also enclosed are the West Perimeter Channel Slope Stability Analysis and West Perimeter Hydraulics Analysis for the design.

The Original Landfill Monitoring and Maintenance Plan modification we are preparing for submittal will include reference to the design drawing and the analysis, as approved. We are planning to start construction in early November 2008.

If you have any questions regarding the information in this correspondence or the enclosures, please contact me at (720) 377-9682 or Jim Erickson at (303) 880-4336.

Sincerely,

Scott R. Surovchak
LM Site Manager

RJD/abm

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1000 Independence Ave., S.W., Washington, DC 20585	☐	11025 Dover St., Suite 1000, Westminster, CO 80021
10995 Hamilton-Cleves Highway, Harrison, OH 45030	☐	955 Mound Road, Miamisburg, OH 45342
232 Energy Way, N. Las Vegas, NV 89030	☐	
REPLY TO: Westminster, CO Office		

4/63

Enclosures

cc:
Vera Moritz, EPA
Jim Erickson, Stoller
Linda Kaiser, Stoller
Post Closure AR
rc-rocky.flats

TETRA TECH

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Calculation Cover Sheet

Calc. No.: 2 Revision B **Doc No.:**	**Discipline:** **Slope Stability Analyses**	**No. of Sheets: 13 (include out put files and figures)**

Location: Rocky Flats

Project: 114-181750.107.1

Site: Original Landfill

Feature: West Perimeter Channel Slope Stability

Sources of Data:

Topographic Survey: Flatirons, Inc. – June 25-27, 2008

Appendix E – Slope Stability Analysis – Rocky Flats Original Landfill Geotechnical Investigation –Tetra Tech. June 2008.

Sources of Formulae and References:

SLOPE/W© 2007. Developed by GEO-SLOPE International Ltd. www.geo-slope.com

Preliminary Calc. ☐ **Final Calc.** ■ **Supersedes Calc. No. 2A (8/14/08)**

Author:	**Ana Mohseni, PhD**	**10/14/08**	**Checked by:**	**Jim Kienholz**	**10/14/08**
	Name	**Date**		**Name**	**Date**
Approved by:	Daniel Nordeen 2008.10.28 10:36:31 -06'00'			**Name**	**Date**
	Name	**Date**		**Name**	**Date**
				Name	**Date**

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Problem Statement:

This memorandum addresses the slope stability analyses for three sections (G, H and I) of the Original Landfill (OLF) within Rocky Flats. The sections are shown on Figure 1 and are located across the west perimeter channel. Section G was previously analyzed for stability in the June 2008 Rocky Flats Original Landfill Geotechnical Investigation. Sections H and I are a new and are shown on Figure 1. The existing slope gradients range for these three sections are 4: 1, 3:1 and 3:1 respectively. The materials at the OLF include a cover material derived from the Rocky Flats Alluvium, remnant slide material, an organic layer, weathered bedrock, and comparatively un-weathered claystone/shale bedrock of the Laramie Formation.

The Original Landfill (OLF) is located south of the former RFETS Buildings 440 and 460, along the north hillside of a ravine in the Woman Creek drainage area, extending from approximate elevation 6,040 feet at the top to elevation 5,950 feet at its base. Waste operations began in the early 1950s and continued through 1968. The OLF site footprint has a maximum length along the east-west direction of approximately 1,700 feet, and approximately 500 feet in the north-south direction, with an approximate area of 20 acres. Construction activities at the OLF were conducted in 2005 and included regrading, placement of a two-foot final cover and construction of the diversion berms.

Settlement cracks, differential settlement, subsidence in drainage channels, and seeps that created saturated areas or direct surface flows on the cover or near the buttress toe have been found on inspections, which triggered the need for the geotechnical investigation to determine if these conditions are likely to influence the integrity of the existing cover and surface water drainage over the OLF.

According to the Geotechnical Investigation, several areas of distress were observed on the OLF. On the western side of the OLF, a curvilinear crack and "scarp" trending northeasterly was visible (section H). Cracking extends through the final cover. Stoller reported the crack to have a displacement on the order of as much as 18 inches. A small bulge or mound of soil was apparent down the slope marking the apparent toe of the slope failure. The failure appeared consistent with a classical circular "slump" type slope failure.

Smaller slope failures were observed in sidewalls of the east and the west channels. These failures also appeared to be slump type failures, and occurred in steeper portions of the drainage channel sidewalls (section G).

For the Geotechnical Investigation, Tetra tech performed several slope stability analyses in seven different cross-sections (A-G) as shown on Figure1 using back-calculation based on the known locations of slope failures. These analyses show that the strength properties were lower than the strength properties used in pervious analyses performed by Earth Tech. The presence of organic material was also encountered during the field investigations performed by Tetra Tech in early 2008. The soil properties previously back-calculated by Tetra Tech were also used in this analysis. An elevated water table was used in these scenarios to model existing conditions and conditions that were shown to exist at the time the failures occurred.

Methods of Analysis:

The stability analyses were conducted on idealized two-dimensional cross-sections of the embankment using the Slope/W components of GeoStudio 2007 by Geo-Slope International, Ltd (1991). Stability was analyzed with Slope/W using limiting equilibrium principles. Potential

failure surfaces utilized the Spencer method, which satisfies both force and moment equilibrium. The Slope/W program incorporates a search routine to locate those failure surfaces with the least factor of safety within user defined search limits. Trial failure surfaces were defined with "entry and exit" parameters, resulting in a range of possible locations to search for the most critical (lowest factor of safety) potential failure surface. Analyses were performed using Mohr-Coulomb failure criteria for the materials.

Stability analyses were conducted on the slopes in the static and seismic conditions. Design criteria used by Earth Tech (2005) in the design of the OLF followed the Resource Conservation and Recovery Act (RCRA) and Colorado Hazardous Waste Act closure standard from interim status units (6 Code of Colorado Regulations (CCR) 1007-3, section 265.111), the minimum factor of safety (FS) assumed for the static analysis is equal to 1.5 and for the seismic analyses the minimum factor of safety is equal to 1.0. As determined in the Geotechnical Investigation Phase 3 Stability Analysis Technical Support Memorandum of the Accelerated Action Design for the Original Landfill ((Phase 3 report) Earth Tech 2004) as mentioned in the Earth Tech Report (2005), the horizontal acceleration used for the pseudo-static downstream analysis was 0.06g.

Material properties:

Material properties used in these analyses were obtained from the Tetra Tech 2008 Geotechnical Investigation and slope stability back analyses (Appendix E of the 2008 Geotechnical Investigation). Material properties are summarized on Table 1.

Table 1 – Material Properties

Material Type	Total Unit Weight, γ (pcf)	Internal Friction Angle, ϕ (degrees)	Cohesion, c (psf)
Cover	125	24	100
Slide	120	20	50
Weathered bedrock	125	21	50
Bedrock	130	28	300
Organic Layer	90	10	0

Results:

In order to reach the minimum factors of safety mentioned above, the slope in section H on the landfill side of the channel needs to be regraded to a 4(H):1(V) slope and the bottom of the channel needs to be raised a minimum of 3.0 feet. The slope in section G will require a 4(H):1(V) or flatter and also require raising the channel bottom a minimum 3.4 feet. Section I will need to be regraded to a 4:1 slope and the bottom of the channel needs to be raised a minimum of 4.4 ft. All of the stability analyses in these new geometry resulted in acceptable static factors of safety. For ease of construction, the west perimeter channel shall not have a channel depth greater than 10.0 feet and the landfill side slope shall be 4(H):1(V) or flatter. **When construction activities modify the side slope, fill shall be used to modify the slope as excavating/cutting into the existing landfill slope will reduce the factor of safety to unacceptable levels.** The GeoStudio output is presented in an attachment to this memorandum, and the results are summarized in Table 2.

Table 2 – Stability Analyses Results

Section	Static	Pseudo-static
G	1.54	1.15
H	1.50	1.18
I	1.66	1.27

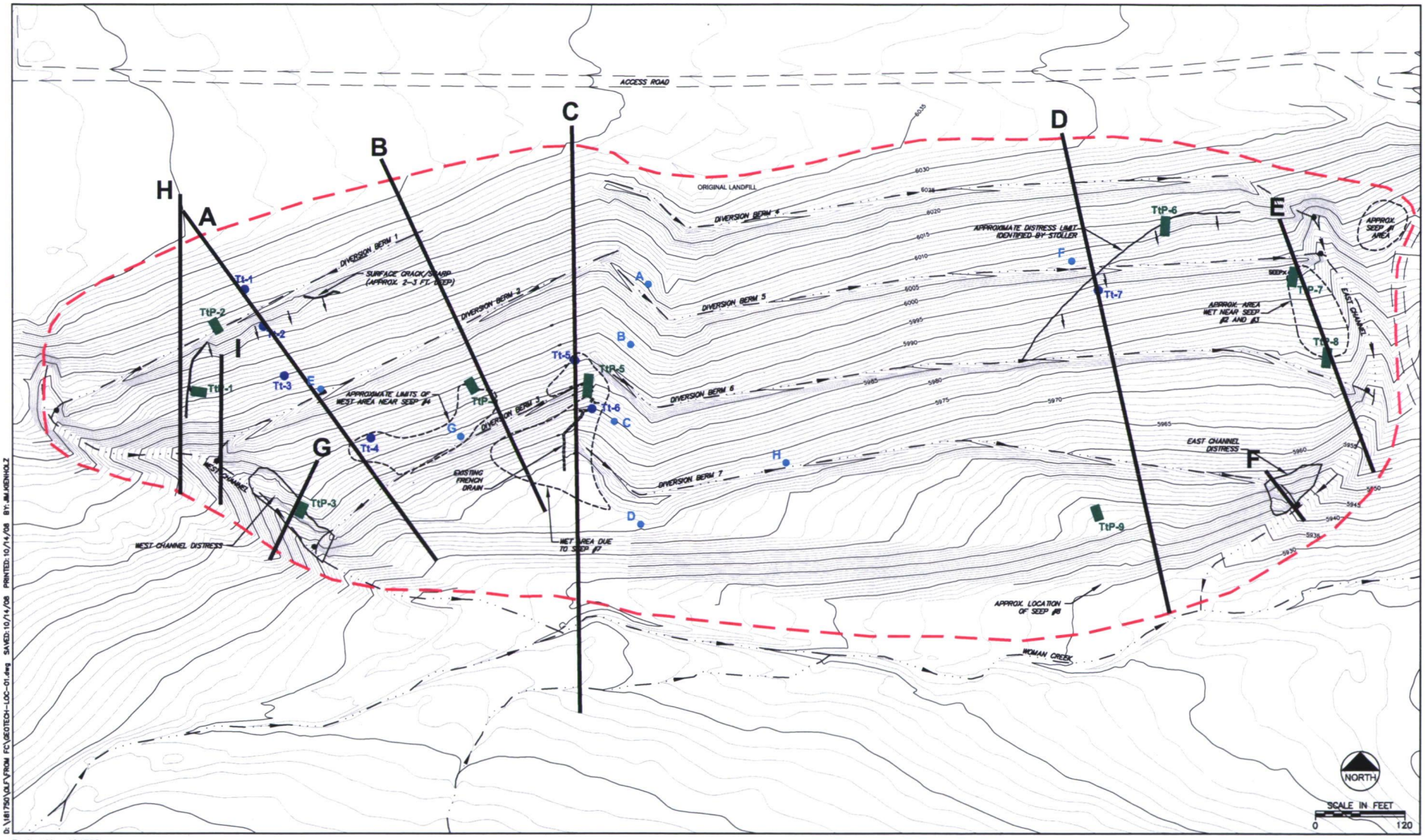
References

GEO-SLOPE International, Ltd., 1991, GeoStudio 2007, Version 7.03 (software)

Earth Tech (2005). Accelerated Action Design fro the Original Landfill Rocky Flats Environmental Technology Site – Final Design and Design Calculations (Appendicies A-G), Kaiser Hill Company.

Tetra Tech (2008). Rocky Flats Original Landfill Geotechnical Investigation. June, 2008.

United States Department of Agriculture, Natural Resources Conservation Service, Conservation Engineering Division (2005) *Earth Dams and Reservoirs.*TR-60. July 2005. 4000



Project No. 181750

August 2008

LEGEND:

- DITCH/CHANNEL/CREEK
- SLUMP OR SUBSIDENCE LINE AND DIRECTION
- ROAD
- SETTLEMENT MONUMENT (EXISTING)
- APPROXIMATE LIMITS OF GEOTECHNICAL INVESTIGATION
- TEST PIT LOCATION
- TEST BORING AND INCLINOMETER LOCATION

FIGURE 1
LOCATIONS OF SLOPE STABILITY CROSS SECTIONS

APPENDIX

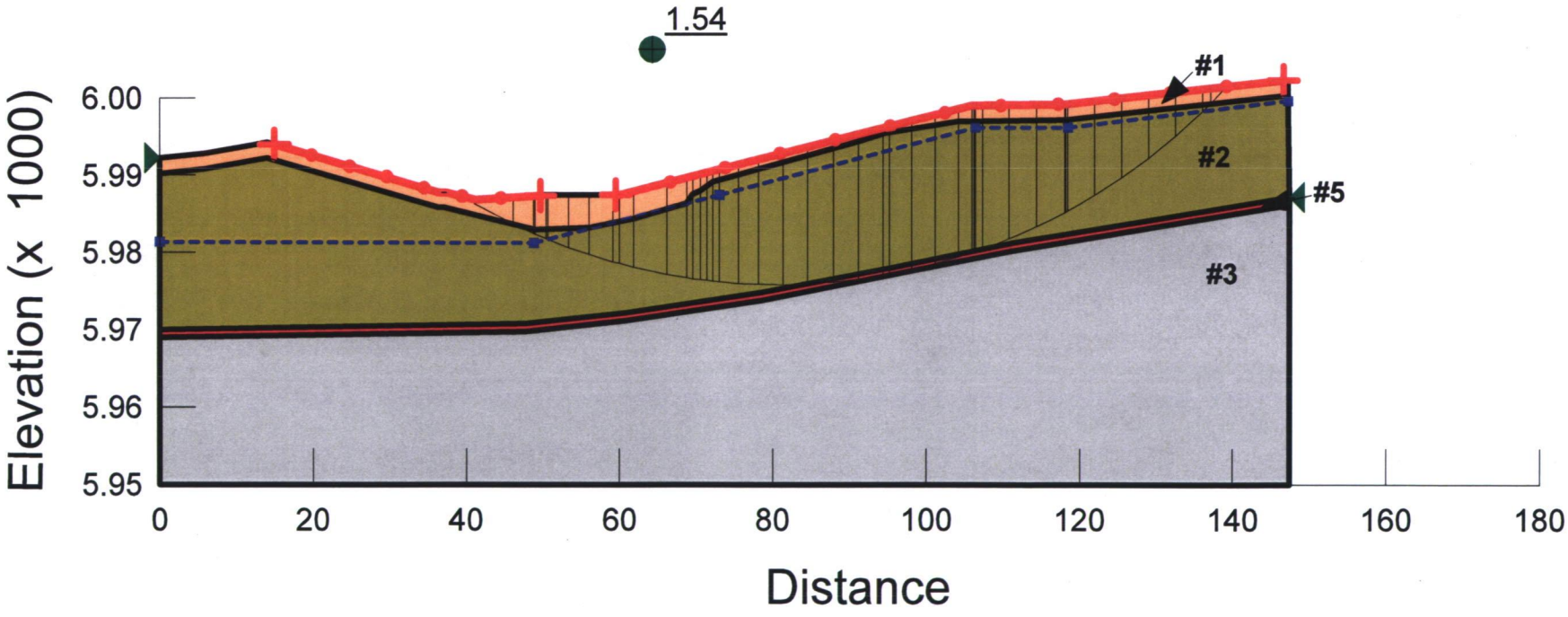
Slope Stability Output Files

Rocky Flats Original Landfill Geotechnical Investigation

Cross Section G
Tetra Tech Properties - High Water Table

Static Analysis

Name: Cover Material Unit Weight: 125 pcf Cohesion: 100 psf Phi: 24 °
Name: Slide Material Unit Weight: 120 pcf Cohesion: 50 psf Phi: 20 °
Name: Weathered Bedrock Unit Weight: 125 pcf Cohesion: 50 psf Phi: 17 °
Name: Organic Unit Weight: 90 pcf Cohesion: 0 psf Phi: 10 °



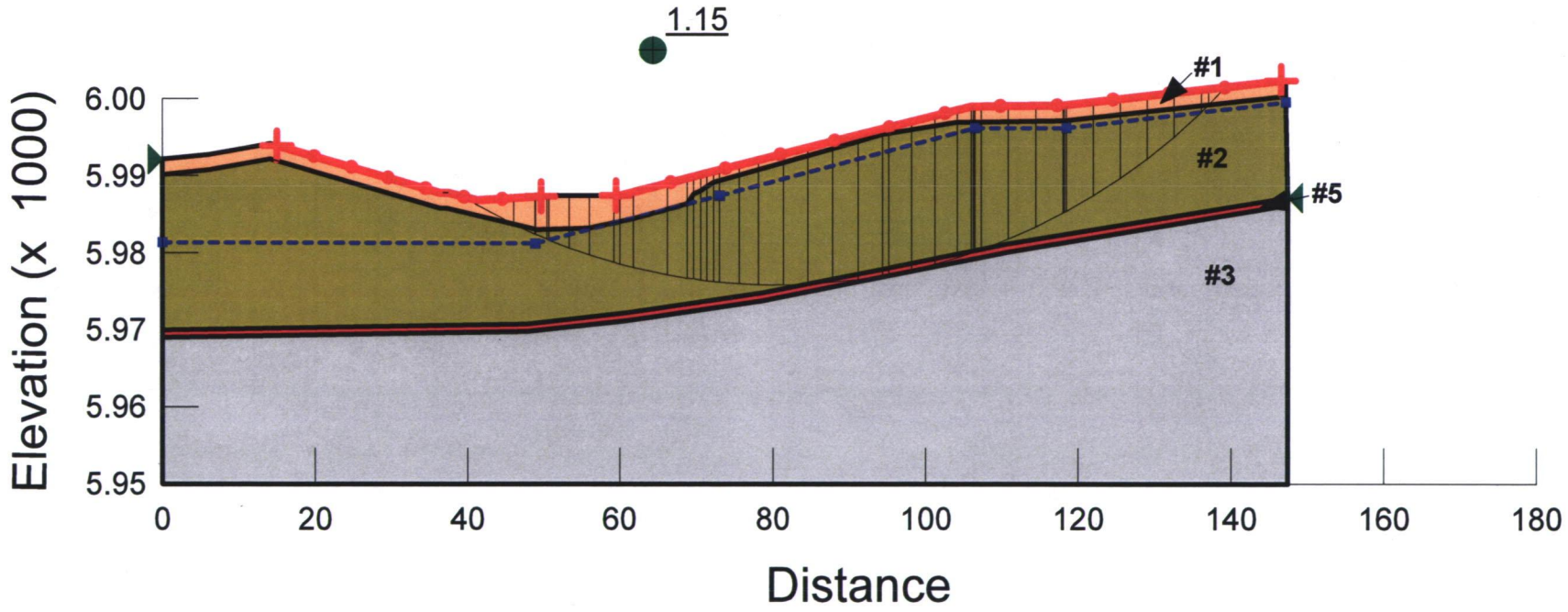
File Name: RF_G_03_new.gsz
Date: 8/8/2008

Rocky Flats Original Landfill Geotechnical Investigation

Cross Section G
Tetra Tech Properties - High Water Table

Pseudostatic Analysis
Horizontal Acceleration: 0.06

Name: Cover Material Unit Weight: 125 pcf Cohesion: 100 psf Phi: 24 °
Name: Slide Material Unit Weight: 120 pcf Cohesion: 50 psf Phi: 20 °
Name: Weathered Bedrock Unit Weight: 125 pcf Cohesion: 50 psf Phi: 17 °
Name: Organic Unit Weight: 90 pcf Cohesion: 0 psf Phi: 10 °



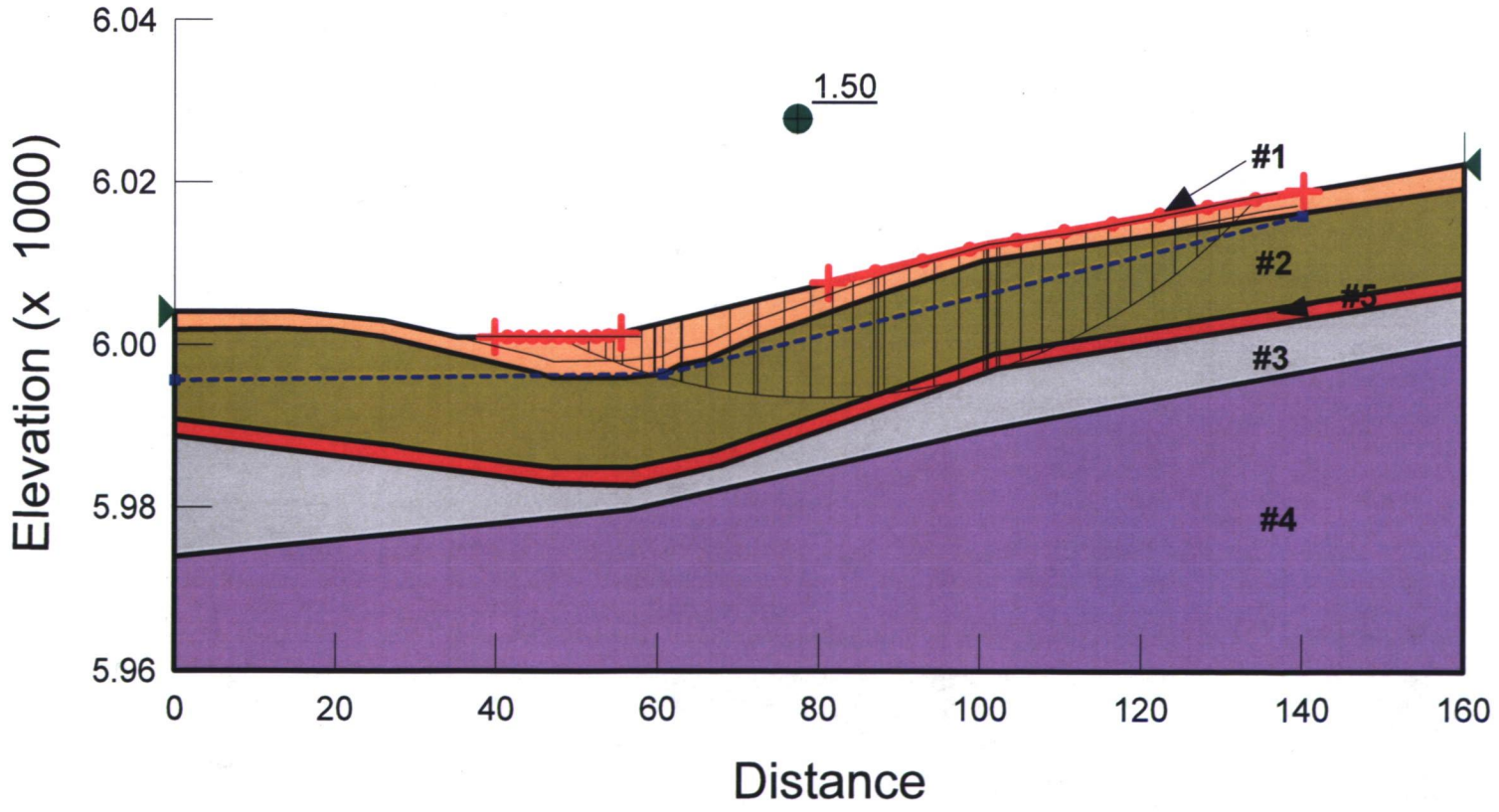
File Name: RF_G_03_new.gsz
Date: 8/8/2008

Rocky Flats Original Landfill Geotechnical Investigation

Cross Section H
Tetra Tech Material Properties - High Water Table

Static Analysis

Name: Material #1 - Cover material Unit Weight: 125 pcf Cohesion: 100 psf Phi: 24 °
Name: Material #2 - Slide Material Unit Weight: 120 pcf Cohesion: 50 psf Phi: 20 °
Name: Material #3 - Weathered bedrock Unit Weight: 125 pcf Cohesion: 50 psf Phi: 21 °
Name: Material #4 - Bedrock Unit Weight: 130 pcf Cohesion: 300 psf Phi: 28 °
Name: Material # 5 - Organic material Unit Weight: 90 pcf Cohesion: 0 psf Phi: 10 °

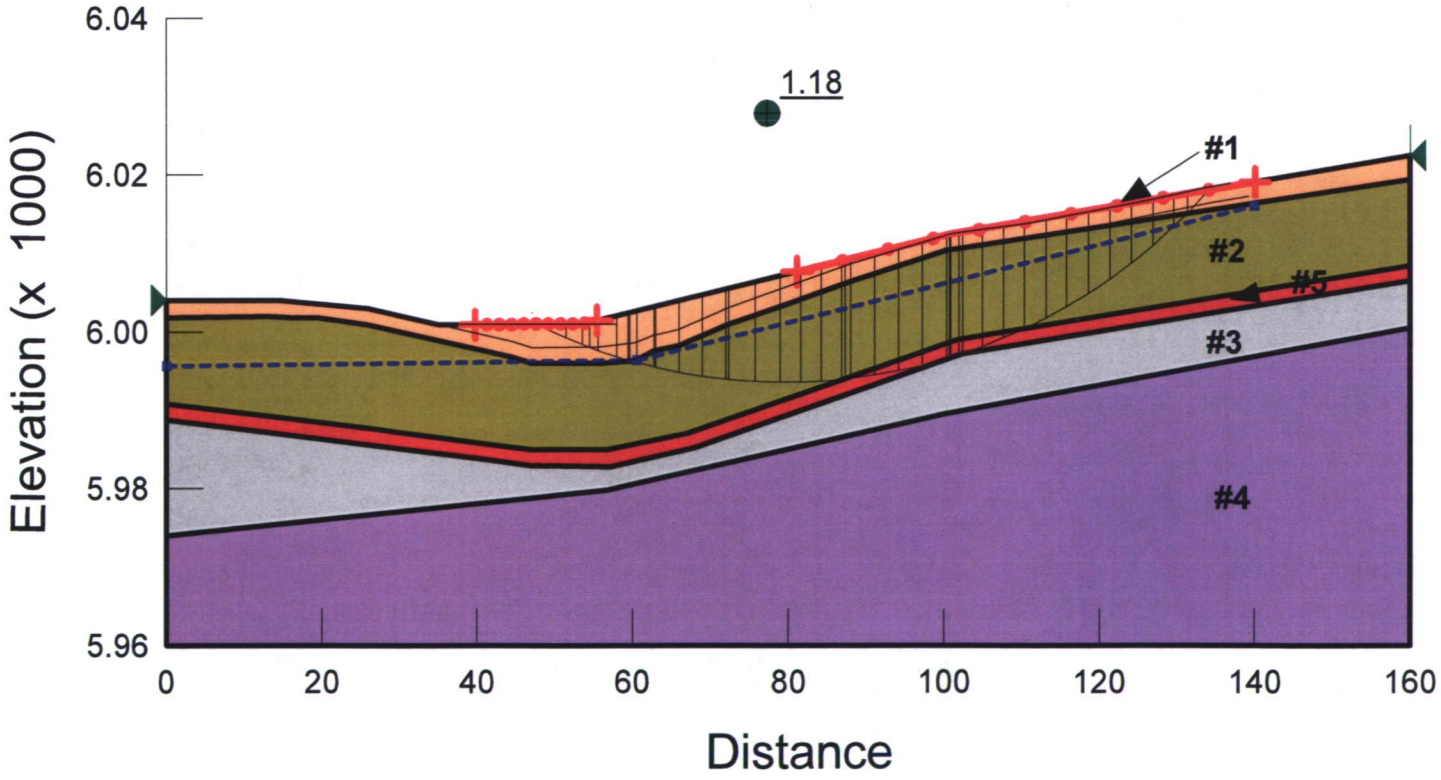


Rocky Flats Original Landfill Geotechnical Investigation

Cross Section H
Tetra Tech Material Properties - High Water Table

Pseudostatic Analysis
Horizontal Acceleration: 0.06

Name: Material #1 - Cover material Unit Weight: 125 pcf Cohesion: 100 psf Phi: 24 °
Name: Material #2 - Slide Material Unit Weight: 120 pcf Cohesion: 50 psf Phi: 20 °
Name: Material #3 - Weathered bedrock Unit Weight: 125 pcf Cohesion: 50 psf Phi: 21 °
Name: Material #4 - Bedrock Unit Weight: 130 pcf Cohesion: 300 psf Phi: 28 °
Name: Material # 5 - Organic material Unit Weight: 90 pcf Cohesion: 0 psf Phi: 10 °



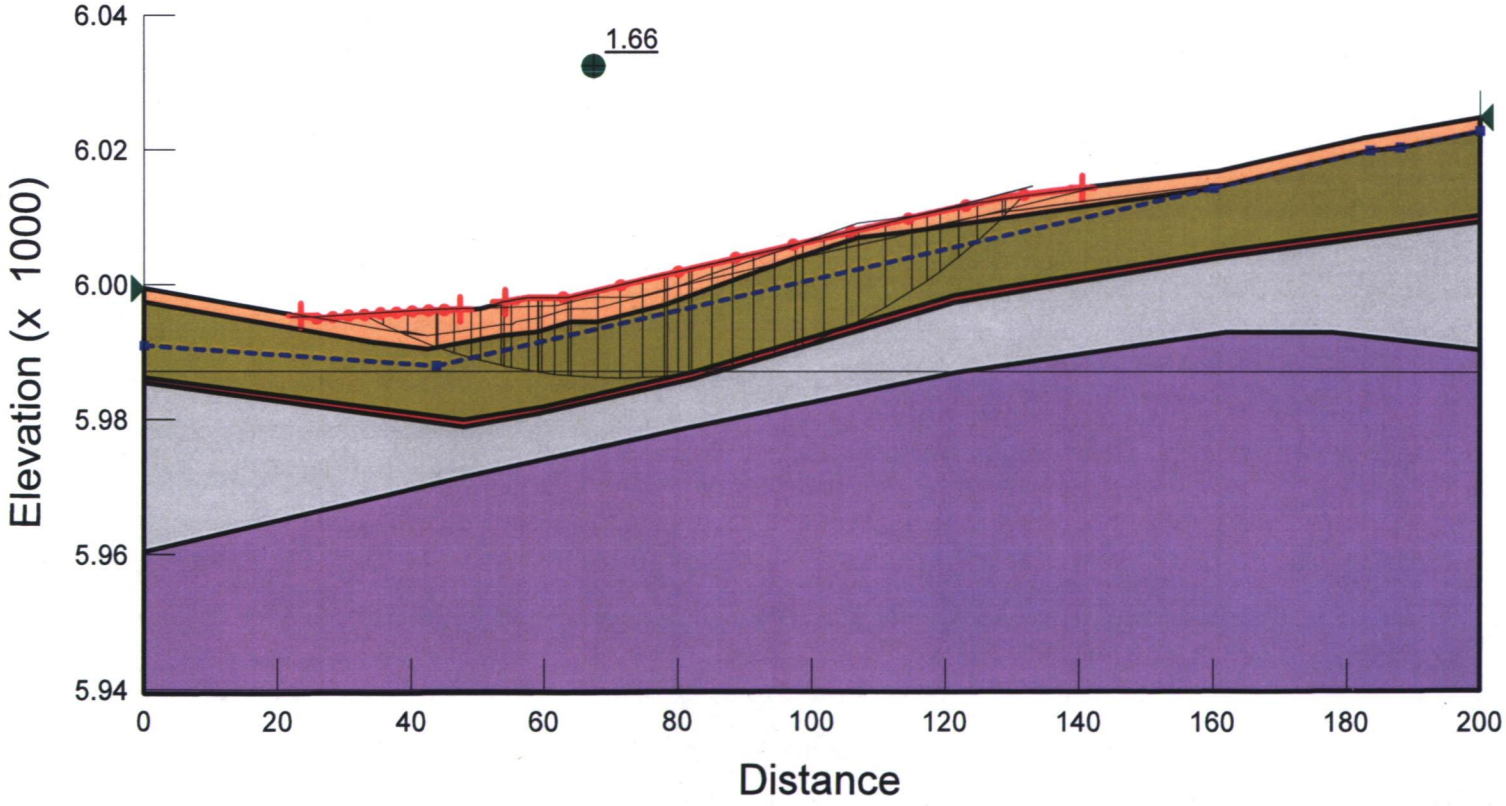
File Name: RF_06_PSb.gsz
Date: 8/7/2008

Rocky Flats Original Landfill Geotechnical Investigation

Cross Section I
Tetra Tech Material Properties - High Water Table

Static Analysis

Name: Material #1 - Cover material Unit Weight: 125 pcf Cohesion: 100 psf Phi: 24 °
Name: Material #2 - Slide Material Unit Weight: 120 pcf Cohesion: 50 psf Phi: 20 °
Name: Material #3 - Weathered bedrock Unit Weight: 125 pcf Cohesion: 50 psf Phi: 21 °
Name: Material #4 - Bedrock Unit Weight: 130 pcf Cohesion: 300 psf Phi: 28 °
Name: Material # 5 - Organic material Unit Weight: 90 pcf Cohesion: 0 psf Phi: 10 °

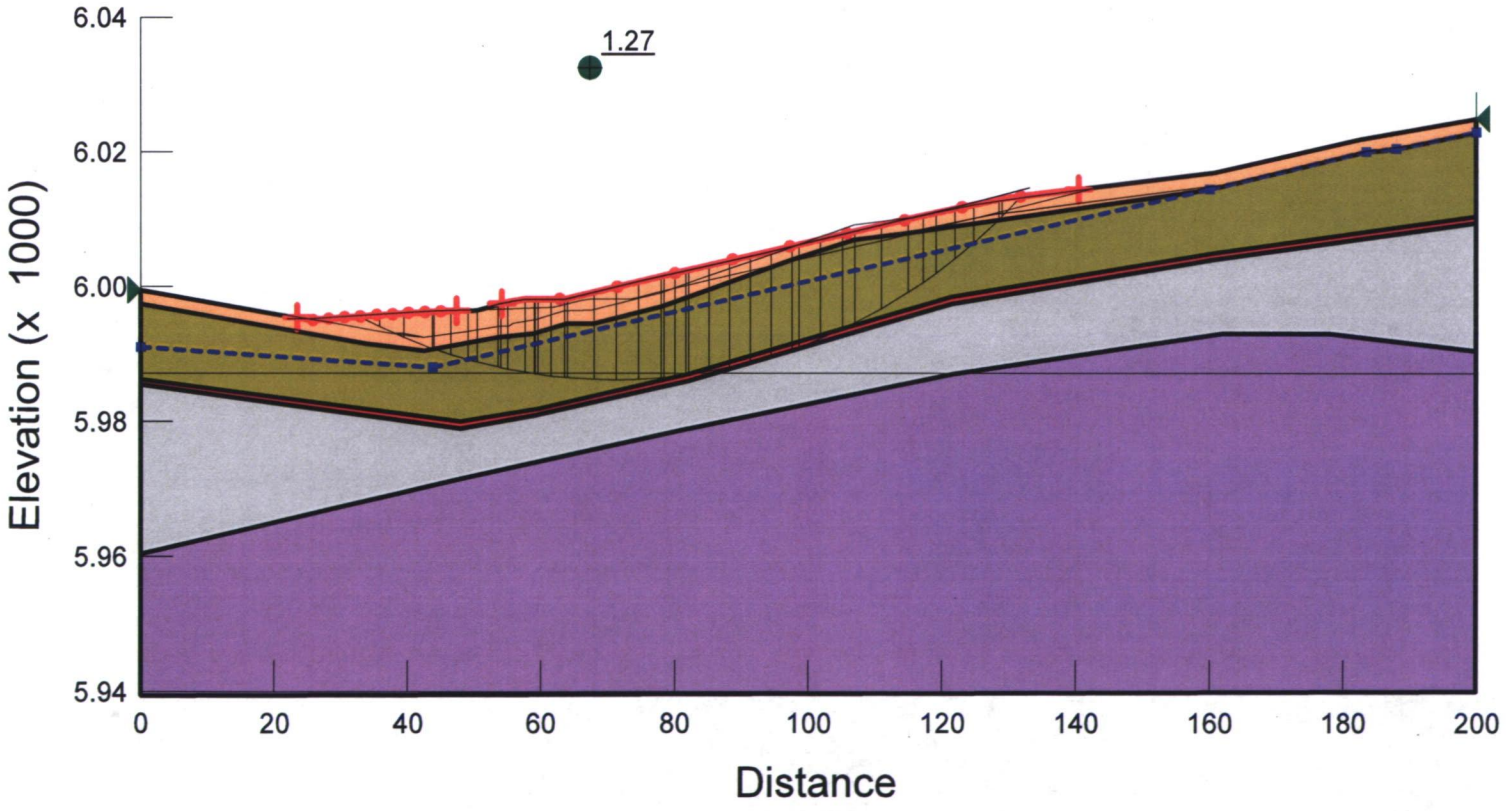


Rocky Flats Original Landfill Geotechnical Investigation

Cross Section I
Tetra Tech Material Properties - High Water Table

Pseudostatic analysis
Value: 0.06

Name: Material #1 - Cover material Unit Weight: 125 pcf Cohesion: 100 psf Phi: 24 °
Name: Material #2 - Slide Material Unit Weight: 120 pcf Cohesion: 50 psf Phi: 20 °
Name: Material #3 - Weathered bedrock Unit Weight: 125 pcf Cohesion: 50 psf Phi: 21 °
Name: Material #4 - Bedrock Unit Weight: 130 pcf Cohesion: 300 psf Phi: 28 °
Name: Material # 5 - Organic material Unit Weight: 90 pcf Cohesion: 0 psf Phi: 10 °



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Calculation Cover Sheet

Calc. No.: 1
Doc No.:
Discipline: Hydraulic Analyses
No. of Sheets: 4

Location: Rocky Flats

Project: 114-181750.107.1

Site: Original Landfill

Feature: West Perimeter Hydraulics

Sources of Data:

Appendix D – Landfill Engineering - Final Design Surface Water Management System Assessment of the OLF Final Design Analysis and Design Calculations Report – Kaiser Hill Company. May 2005

Topographic Survey: Flatirons, Inc. June 25-27, 2008

30% Design Drawings – OLF West Perimeter Channel Stabilization, August 2008.

OLF Diversion Berm Hydrologic/Hydraulic (HEC-RAS) Calculation Set. Tetra Tech. July 2008.

Sources of Formulae and References:

FlowMaster v 5.12. Developed by HAESTAD Methods, Inc. 1994-1995

Preliminary Calc. ☐ **Final Calc.** ☒ **Supersedes Calc. No.**

	Name	Date		Name	Date
Author:	Nick Broderick	10/9/08	**Checked by:**	Jim Kienholz	10/13/08
Approved by:	Daniel Nordeen 2008.10.28 10:38:33 -06'00'				

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Problem Statement:

According to slope stability analyses of the existing (as constructed) west perimeter channel, the channel bottom will need to be raised to have acceptable factors of safety for stability. This calculation memorandum addresses the modification to the west perimeter channel and the minimum height requirement necessary to handle the 1000-year, 24-hour peak discharge for the Original Landfill surface water control structures (diversion berms) DB-1, DB-2, and DB-3. These three drainage basins are responsible for diversion of peak flow into the west perimeter channel.

The original design as obtained from *Appendix D- Landfill Engineering- Final Design Surface Water Management System Assessment of the OLF Final Design Analysis and Design Calculations Report* specified a west perimeter channel with a minimum channel depth of 2.0 Ft, 3(H):1(V) side slope, and a bottom width of 10 Ft. However, the channel was constructed much deeper than designed; Existing channel depth ranges from 4 to 12 ft. deep on the west side slope and 4 to 16 ft. deep on the east side slope. Slope stability analyses suggest that the maximum depth allowed for the east side slolpe is 10 ft. for proper stability.

This calculation set analyzes the modified channel specification for accommodating the revised 1000-yr, 24-hr peak flow rate. This revised peak flow rate was estimated in the *July 2008 OLF Diversion Berms Hydrologic/Hydraulic Analyses Calculation Set* completed by Tetra Tech.

Method of Solution:

- Utilize existing 1,000 yr., 24 hr. storm event discharge from *OLF Diversion Berm Hydrologic/Hydraulic Calculation Set (July 2008).*
- Sum the 1,000 yr., 24 hr. discharge for each western drainage basin
- Estimate existing side-slopes
- Utilize FlowMaster software which utilizes Manning's equation to solve for estimated maximum flow depth
- Verify the designed channel height is capable of handling the estimated maximum flow depth

Assumptions:

It is assumed that the west perimeter channel peak flow is the summation of the upstream diversion berm peak flows as estimated in the *OLF Diversion Berm Hydrologic/Hydraulic Calculation Set (DB-1, DB-2, DB-3).* Assumptions in this calculation set utilize assumptions/results obtained from *Appendix D – Landfill Engineering - Final Design Surface Water Management System Assessment of the OLF Final Design Analysis and Design Calculations Report* such as the class B retardant class for manning's coefficient.

Calculation:

Results of calculations are shown on the following tables, drawings and references.

Discussion and Conclusions/Recommendations:

The table below summarizes the maximum flow depth required to handle the 1000-yr., 24-hr runoff event. The maximum flow depth as estimated through FlowMaster analysis is equivalent to the minimum berm height requirement for the western perimeter control channel.

Table 1

1000-YR, 24-HR STORM EVENT	
Area ID	**Peak Discharge (cfs)**
DB-1	14.08
DB-2	17.32
DB-3	11.32
Total	**42.72**

Note: See Ref. A for table from OLF Diversion Berm Calc. Set.[1]

The analysis shows that the modified parameters of the western perimeter side channel are more than capable of handling the 1,000-yr., 24-hr storm event as the flow depth is approximately 0.51 feet and the minimum designed channel depth is approximately 4.0 feet. The maximum flow velocity is approximately 8.4 feet per second which is acceptable for the turf reinforcement matting (TRM, North American Green P550) for unvegetated flow (12.5 fps).

As seen below in table 2, the channel could convey approximately 55 times the 1,000-yr, 24-hr. estimated peak discharge. The minimum west perimeter channel depth with freeboard would be 2.0 feet; therefore, additional fill could be brought in during construction to stabilize the slope even further than designed.

Table 2

Min. West Perimeter Channel Depth	4.0	ft
Maximum discharge (Q)	2,372	cfs
1000 yr, 24 hr storm event discharge (Q)	42.72	cfs
Channel Capacity	55x	
This channel is capable of conveying 55 times the estimated 1,000 yr, 24-hr peak discharge		

[1] From *OLF Diversion Berm Hydrologic/Hydraulic Calculation Set*

RUN No 1

Western Perimeter Hydraulics
Worksheet for Trapezoidal Channel

Project Description	
Project File	j:\bld01\programs\haested\fmw\nb_rocky.fm2
Worksheet	Berm Peak Flow
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

TO ESTIMATE MAXIMUM CHANNEL FLOW DEPTH USING SMALLEST CHANNEL INVERT SLOPE (10.4 %)

Input Data			
Mannings Coefficient	0.039	–	REF. B
Channel Slope	0.104000	ft/ft	- REF D. 2
Left Side Slope	4.440000	H : V	> D. 1
Right Side Slope	4.000000	H : V	
Bottom Width	10.00	ft	- REF D. 1
Discharge	42.72	cfs	- TABLE 1 / REF A

Results			
Depth	0.51	ft	<< 4.0 FT.
Flow Area	6.14	ft²	
Wetted Perimeter	14.39	ft	
Top Width	14.27	ft	
Critical Depth	0.74	ft	
Critical Slope	0.026672	ft/ft	
Velocity	6.96	ft/s	- < 12.5 fps (SEE REF C)
Velocity Head	0.75	ft	
Specific Energy	1.26	ft	
Froude Number	1.87		
Flow is supercritical.			

RUN. No. 2

Western Perimeter Hydraulics
Worksheet for Trapezoidal Channel

Project Description	
Project File	j:\bld01\programs\haested\fmw\nb_rocky.fm2
Worksheet	Berm Peak Flow
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

TO ESTIMATE MAX. CHANNEL VELOCITY USING STEEPEST CHANNEL INVERT SLOPE (18.2%)

Input Data		
Mannings Coefficient	0.039	
Channel Slope	0.183000	ft/ft
Left Side Slope	4.440000	H : V
Right Side Slope	4.000000	H : V
Bottom Width	10.00	ft
Discharge	42.72	cfs

Results		
Depth	0.43	ft
Flow Area	5.08	ft²
Wetted Perimeter	13.73	ft
Top Width	13.63	ft
Critical Depth	0.74	ft
Critical Slope	0.026672	ft/ft
Velocity	8.40	ft/s
Velocity Head	1.10	ft
Specific Energy	1.53	ft
Froude Number	2.43	
Flow is supercritical.		

— < 12.5 fps (see REF. C)

RUN No. 3

Western Perimeter Channel Capacity
Worksheet for Trapezoidal Channel

Project Description	
Project File	j:\bld01\programs\haested\fmw\nb_rocky.fm2
Worksheet	Peak flow
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

TO ESTIMATE MAX. DISCHARGE CONVEYED IN DESIGNED CHANNEL X-SECTION (4.0 FT. DEPTH)

Input Data		
Mannings Coefficient	0.039	
Channel Slope	0.104000	ft/ft
Depth	4.00	ft
Left Side Slope	4.440000	H : V
Right Side Slope	4.000000	H : V
Bottom Width	10.00	ft

Results		
Discharge	2,371.78	cfs
Flow Area	107.52	ft²
Wetted Perimeter	44.70	ft
Top Width	43.76	ft
Critical Depth	6.15	ft
Critical Slope	0.014950	ft/ft
Velocity	22.06	ft/s
Velocity Head	7.56	ft
Specific Energy	11.56	ft
Froude Number	2.48	
Flow is supercritical.		

Ref. A

TABLE 1 - HYDROLOGY CALCULATIONS
ROCKY FLATS - ORIGINAL LANDFILL
2008 DIVERSION BERM ANALYSES

Area ID		Subarea SF	Subarea ACRE	Cumulative Area ACRE	Cumulative Area MI^2	Overland Flow Length, ft	Channel Length, ft	Time of Concentration Tc, sec.	Time of Concentration Tc, hr	Unit Peak Discharge, q_u	100-YR, 24-HR STORM EVENT Peak Discharge, cfs	100-YR, 24-HR STORM EVENT Appendix D Estimation	1000-YR, 24-HR STORM EVENT Peak Discharge, cfs	1000-YR, 24-HR STORM EVENT Appendix D Estimation	Appendix D Drainage Area	% Change App. D to Existing Cond. Analyses Drainage Area	% Change App. D to Existing Cond. Analyses 1000 Peak	Channel Depth, ft 100-YR	Channel Depth, ft 1,000-YR
DB-1	A	23,184	0.53	1.88	0.003	-	120	231.57	0.064	1000	10.19	8.61	14.08	11.68	1.50	125%	121%	1.37	1.48
	B	34,931	0.80	1.35	0.002	-	200	183.57	0.051	1000	7.30		10.09					1.56	1.68
	C	23,795	0.55	0.55	0.001	70	200	103.57	0.029	1000	2.96		4.09					1.35	1.46
DB-2	A	25,054	0.58	2.31	0.004	-	172	277.47	0.077	1000	12.54	13.21	17.32	17.91	2.30	101%	97%	1.55	1.66
	B	30,101	0.69	1.74	0.003	-	200	208.67	0.058	1000	9.42		13.02					1.58	1.69
	C	45,648	1.05	1.05	0.002	160	187	128.67	0.036	1000	5.68		7.84					1.47	1.57
DB-3	A	32,580	0.75	1.51	0.002	-	205	218.57	0.061	1000	8.20	9.76	11.32	13.23	2.30	66%	86%	1.51	1.62
	B	33,322	0.76	0.76	0.001	168	200	136.57	0.038	1000	4.14		5.73					1.23	1.34
DB-4	A	11,892	0.27	1.51	0.002	-	165	407.89	0.113	1000	8.18	14.36	11.31	19.46	2.50	60%	58%	1.24	1.33
	B	12,900	0.30	1.24	0.002	-	200	341.89	0.095	1000	6.70		9.26					1.42	1.52
	C	14,351	0.33	0.94	0.001	-	200	261.89	0.073	1000	5.10		7.05					1.20	1.29
	D	14,555	0.33	0.61	0.001	-	200	181.89	0.051	1000	3.31		4.58					0.97	1.06
	E	12,096	0.28	0.28	0.000	65	200	101.89	0.028	1000	1.50		2.08					1.00	1.06
DB-5	A	15,749	0.36	2.38	0.004	-	165	424.72	0.118	1000	12.90	14.36	17.82	19.46	2.50	95%	92%	1.68	1.80
	B	22,090	0.51	2.02	0.003	-	200	358.72	0.100	1000	10.94		15.12					1.56	1.67
	C	22,964	0.53	1.51	0.002	-	200	278.72	0.077	1000	8.19		11.32					1.39	1.51
	D	22,231	0.51	0.99	0.002	-	200	198.72	0.055	1000	5.34		7.38					1.28	1.39
	E	20,691	0.47	0.47	0.001	115	200	118.72	0.033	1000	2.57		3.56					1.44	1.52
DB-6	A	31,809	0.73	2.77	0.004	-	253	460.93	0.128	950	14.27	14.36	19.72	19.46	2.50	111%	101%	1.87	2.01
	B	24,020	0.55	2.04	0.003	-	200	359.73	0.100	1000	11.07		15.30					1.84	1.97
	C	24,164	0.55	1.49	0.002	-	200	279.73	0.078	1000	8.08		11.17					1.44	1.55
	D	22,556	0.52	0.94	0.001	-	200	199.73	0.055	1000	5.08		7.02					1.24	1.33
	E	18,278	0.42	0.42	0.001	118	200	119.73	0.033	1000	2.27		3.14					1.14	1.21
DB-7	A	29,912	0.69	2.72	0.004	-	188	426.26	0.118	1000	14.74	14.36	20.37	19.46	2.50	109%	105%	1.76	1.90
	B	26,149	0.60	2.03	0.003	-	200	351.06	0.098	1000	11.02		15.23					1.56	1.67
	C	21,675	0.50	1.43	0.002	-	200	271.06	0.075	1000	7.77		10.74					1.64	1.74
	D	22,274	0.51	0.94	0.001	-	200	191.06	0.053	1000	5.07		7.01					1.36	1.47
	E	18,532	0.43	0.43	0.001	116	180	111.06	0.031	1000	2.30		3.18					1.14	1.23

A = Outlet (Downstream to Up)

Source:

Overland Velocity: $V=kS^{0.5}$ — See Ref A.4: Equation 3-45
Assume k for short grass pasture
18 percent slope

Overland Velocity:	3.0	fps	See Ref A.5 (k = 0.70)
Channel Velocity:	2.5	fps	Ref B: Average for 1,000 storm event from Appendix D
Curve #:	86		Ref B: Appendix D assumption
S:	1.628		Ref A.6: Equation 7-30
100-YR, 24-HR:	5.0	in	Ref C: NOAA Atlass II Volume III Colorado
Runoff depth, Q_{100}:	3.467	in	Ref A.6: Equation 7-32a
1000-YR, 24-HR:	6.4	in	Ref B: Appendix D Estimation
Runoff depth, Q_{1000}:	4.791	in	Ref A.6: Equation 7-32a
Ia/P:	0.1		Ref A.9 for CN = 86, P = 5.0" and 6.4"
SCS Type II storm			Ref A.10

Description:

Column A	Diversion Berm ID
Column B	Sub-Basin ID
Column C	Area, sf as determined by AutoCAD, See Figure 1A, 1B
Column D	Area conversion
Column E	Cumulative Area, acreage of sub-basin plus upstream sub-basins
Column F	Area conversion for SCS Method
Column G	Length run-off travels prior to channelization
Column H	Length of channel to outlet of sub-basin
Column I	Ref A.4: Assuming overland and channel velocities of Appendix D (Kaiser Hill)
Column J	Time conversion for SCS method
Column K	Ref A.11
Column L	Ref A.9: Equation 7-38
Column M	Ref B: Appendix D estimation
Column N	Ref A.9: Equation 7-38
Column O	Ref B: Appendix D estimation
Column P	Ref B: Appendix D estimation
Column Q	Comparison of Appendix D to Existing Condition Analyses to see correlation
Column R	Comparison of Appendix D to Existing Condition Analyses to see correlation
Column S	HEC-RAS Result - See attached Tables
Column T	HEC-RAS Result - See attached Tables

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Velocity:	2.95 fps		1.35 fps	
X-Section Area:	6.07 sq ft		13.23 sq ft	
Hydraulic Radius:	0.579		0.854	
Froude Number:	0.67		0.25	
Roughness Coefficient:	0.0495		0.1401	

Structure #1 (Vegetated Channel)

Triangular Vegetated Channel Inputs:

Material: Grass mixture

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.0:1	5.6:1	2.0	D, B	1.00			5.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	11.68 cfs		11.68 cfs	
Depth:	1.05 ft	2.05 ft	1.60 ft	2.60 ft
Top Width:	9.01 ft	17.61 ft	13.73 ft	22.33 ft
Velocity:	2.47 fps		1.07 fps	
X-Section Area:	4.72 sq ft		10.95 sq ft	
Hydraulic Radius:	0.510		0.777	
Froude Number:	0.60		0.21	
Roughness Coefficient:	0.0543		0.1669	

Structure #5 (Nonerodible Channel)

Trapezoidal Nonerodible Channel Inputs:

Material: Plastic

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	12.0	0.0390	1.00		

Nonerodible Channel Results:

↑ Input for FlowMaster calcs.

Ref. C.

NORTH AMERICAN GREEN

PERFORMANCE SPECIFICATION

P550

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% UV stabilized polypropylene fiber matrix incorporated into a permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between the bottom and middle ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings and then covered by an ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle, dramatically corrugated (crimped) netting shall form prominent closely spaced ridges across the entire width of the mat. The three nets shall be stitched together on 1.50 inch (3.81 cm) centers with UV stabilized polypropylene thread to form a permanent three-dimensional turf reinforcement matting.

Slope Design Data – Unvegetated Cover Factors

	Slope Gradient (S)		
Slope Length (L)	≤ 3:1	3:1-2:1	≥ 2:1
≤ 20 ft (6 m)	**0.00045**	**0.0145**	**0.0425**
20 – 50 ft	**0.0173**	**0.0305**	**0.0495**
≥ 50 ft (15.2 m)	**0.0345**	**0.0465**	**0.0565**

Channel Design Data

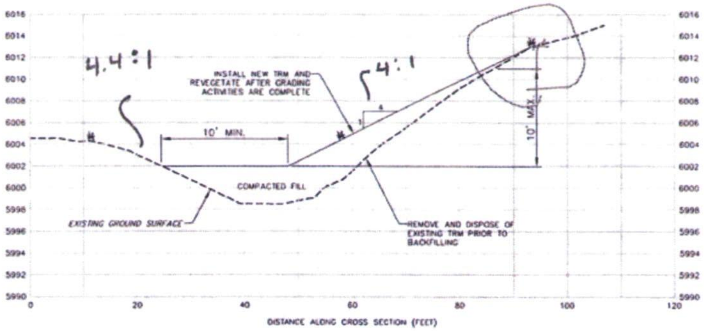
Roughness Coefficients - Unvegetated	
Flow Depth	Manning's 'n'
≤ 0.50 ft (0.15 m)	**0.041**
0.50 – 2.00 ft	**0.040 – 0.014**
≥ 2.00 ft (0.60 m)	**0.013**

Maximum Permissible Shear Stress		
	Short Duration	Long Duration
Phase 1 UNVEGETATED	**4.0 lbs/ft² (191 Pa)**	**3.25 lbs/ft² (156 Pa)**
Phase 2 PARTIALLY VEGETATED	**12.0 lbs/ft² (576 Pa)**	**12.0 lbs/ft² (576 Pa)**
Phase 3 FULLY VEGETATED	**14.0 lbs/ft² (672 Pa)**	**12.0 lbs/ft² (576 Pa)**

Approximate Maximum Flow Velocity
Unvegetated = 12.5 ft/s (3.8 m/s)
Vegetated = 25 ft/s (7.6 m/s)

Values are approximate, precise values can be obtained using ECMDS™

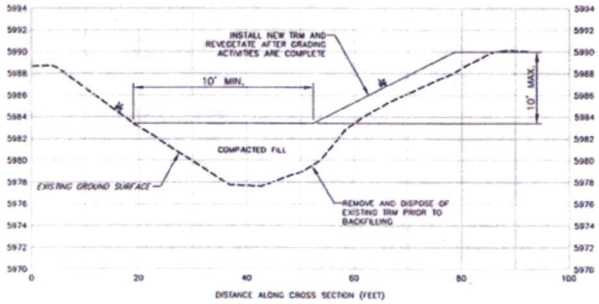
*Performance values obtained through third party testing at the Texas Transportation Institute, Colorado State University, and Utah State University based on soil loss failure criteria not exceeding 0.50 inches (1.27 cm).



A 3|5 WEST PERIMETER CHANNEL

SCALE IN FEET

VERTICAL EXAGGERATION = 2X



B 3|5 WEST PERIMETER CHANNEL

SCALE IN FEET

VERTICAL EXAGGERATION = 2X

50% DESIGN

REF. D.1

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

ORIGINAL LANDFILL
ROCKY FLATS SITE
GOLDEN, COLORADO

APPROVALS
T. BOEHLER --/--/06
J. KIENHOLZ --/--/06
D. NORDEEN --/--/06
L. KAISER --/--/06
(SEE RECORD) --/--/06

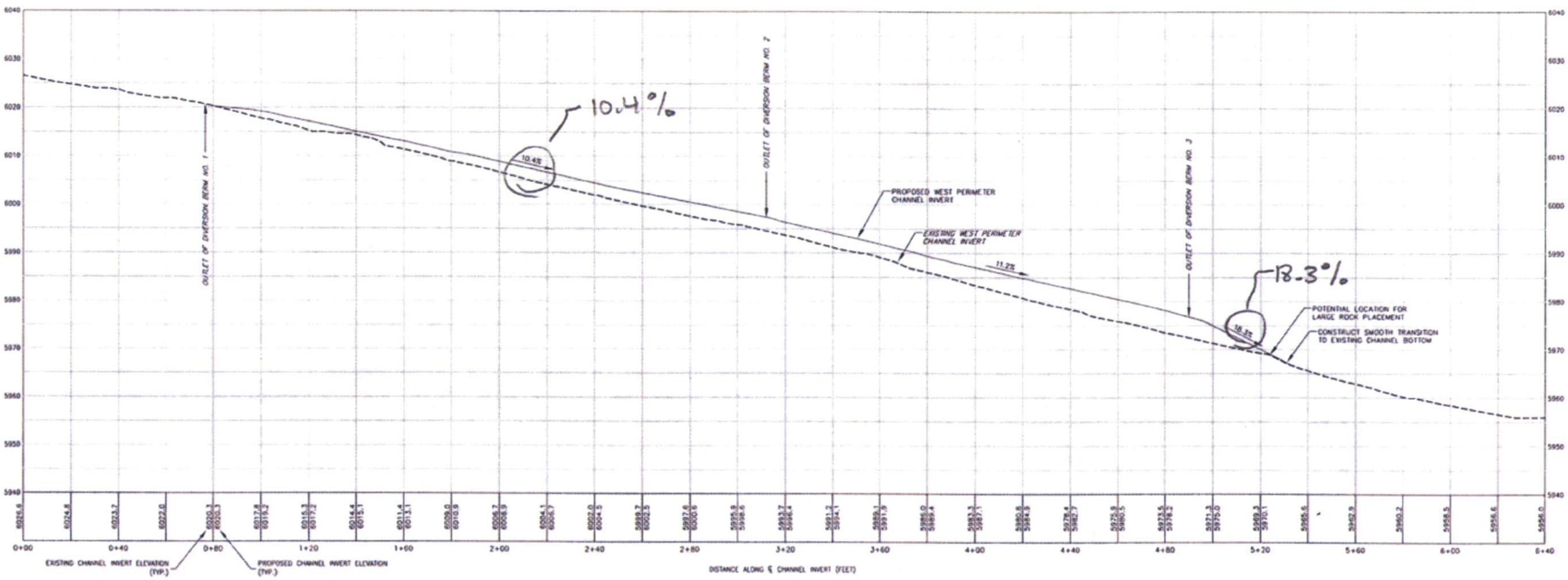
TETRA TECH

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AC01-02GJ79491

ORIGINAL LANDFILL
WEST PERIMETER CHANNEL STABILIZATION

SECTIONS AND DETAILS

LTS-111-0056-07-0010
S04680-RAA-C02-D+
5 OF 5



SLOPE TABLE

STATION	SLOPE
0+80 - 3+15	10.4%
3+15 - 4+95	11.2%
4+95 - 5+30	18.3%

WEST PERIMETER CHANNEL FLOWLINE PROFILE

SCALE IN FEET

VERTICAL EXAGGERATION = 2X

90% DESIGN

REF D.2

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AC01-02GJ79491

ORIGINAL LANDFILL
ROCKY FLATS SITE
GOLDEN, COLORADO

APPROVALS
T. BOEHLER --/--/06
J. KIENHOLZ --/--/06
D. NORDEEN --/--/06
L. KAISER --/--/06
(SEE RECORD) --/--/06

TETRA TECH

ORIGINAL LANDFILL
WEST PERIMETER CHANNEL STABILIZATION

PROFILE

LTS-111-0056-07-0010
S04679-RAB-P01-D+

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Section 01010: Statement of Work

Part 1—General

1.1 Introduction

This statement of work describes the scope of services requested of the subcontractor to perform channel stabilization in the West Perimeter Channel within the Original Landfill (OLF) Site located in the Rocky Flats Project Site. The construction shall consist of building a compacted earth fill access ramp and shall include general earthwork cut and fill to grades shown on the design drawings within the channel bottom and side slopes. Several areas shown also include construction of subsurface rock drains that shall be fabric wrapped. All disturbed surfaces shall receive erosion control fabric and be revegetated.

1.2 Project Background

The U.S. Department of Energy (DOE) is managing the Legacy Management Program including Rocky Flats. S.M. Stoller Corporation is the Legacy Management Support Contractor for DOE (hereinafter referred to as Contractor). Work will be administered from the Contractor's Grand Junction, Colorado office.

1.3 Site Description

The U.S. Department of Energy (DOE) is managing the Legacy Management (LM) Program, which includes the Site. The S.M. Stoller Corporation is the Technical Assistance Contractor for DOE (hereinafter referred to as the Contractor) and is responsible for operations and maintenance activities at the Site. The Contractor has offices in Westminster from which the Site is managed.

The Rocky Flats Site is located off of Colorado State Highway 93 between Boulder and Golden, approximately 18 miles northwest of downtown Denver, Colorado. The Site's West Access Road is located on Highway 93, 3 miles south of the intersection of Highway 128 and Highway 93. The entire site is secured with a range fence and a gate (West Access Gate). The West Access Road is the only access onto the Site. The Site occupies approximately 1,300 acres, of which about 400 acres was a developed Industrial Area. The remainder of the Site was a largely undeveloped area known as the Buffer Zone. The majority of the Site lies within Jefferson County while a small portion of the northern part of the Site lies within Boulder County.

The OLF was used between 1952 and 1968. Accurate and verifiable records of the wastes placed in the landfill are not available. However, approximately 74,000 cubic yards of sanitary waste and construction debris were disposed in the OLF. These types of wastes likely included relatively small quantities of organics, paint and paint thinner, oil, pesticides, and cleaners. Commonly used organics from 1952 to 1968 may have included trichloroethene (TCE), carbon tetrachloride, tetrachloroethene (PCE), petroleum distillates, 1,1,1-trichloroethane, dichloromethane, and benzene. In the 1960s, the landfill may have received polychlorinated biphenyl (PCB) wastes such as carbonless copy paper, transformer and vacuum pump cleanup paper and rags, small capacitors, and fluorescent

light bulbs. Metals such as beryllium, lead, and chromium may also have been placed in the landfill. There is no information indicating that the OLF was used for routine disposal of radioactive material or other hazardous substance waste streams. However, some waste contaminated with radioactive material, most notably wastes from buildings where depleted uranium (DU) operations were conducted, were disposed in the OLF. In addition, in 1965, 60 kilograms (kg) of DU were placed in the landfill after the DU, which was left on a pallet, reportedly ignited on a flatbed truck. The DU was probably covered with soil to extinguish the fire. Efforts were later made to retrieve the DU, but only 40 kg were recovered. Further removal of DU in contaminated surface soil was completed in August 2004 leaving surface soil activities below the action levels.

A raw water treatment plant filter backwash pond was also located within the OLF footprint, and probably abandoned without any backwash sludge removal by 1964. The effluent from the water treatment plant was discontinuous and probably made up of filter backwash, filter pre-wash, sludge blow-down, and other discharges from the water treatment process. It contained filterable solids removed from the raw water, as well as chemical flocculants (aluminum sulfate or lime) and residual chlorine.

During the OLF final closure construction activities, initial air monitoring confirmed that airborne radioactivity was not a hazard, and Level D personal protective equipment (PPE) was subsequently used during the work.

Under the Final Interim Measure/Interim Remedial Action (IM/IRA) for the OLF (DOE 2005a), a 2-foot-thick soil cover was selected to address closure of the OLF. To enhance the slope stability of the landfill, the existing slopes were re-graded prior to placement of the soil cover, and a buttress fill was installed at the toe of the landfill. The remedial action also included installation of perimeter drainage channels and cover diversion berms to control surface water run-on and runoff around the landfill cover. Construction was completed in September 2005, with the final regulatory walk-down occurring on September 12, 2005.

Settlement cracks, differential settlement, subsidence in drainage channels, and seeps that created saturated areas or direct surface flows on the cover or near the buttress toe have been found on inspections, which triggered the need for stabilization of the west perimeter channel. This scope of this work addresses repairs to the West Perimeter Channel Stabilization only.

1.4 Site Access

A. The subcontractor shall not drive, or set materials and equipment off of designated roads, access areas, right-of-ways, staging or lay down areas, etc. In addition, no excavation, grading, leveling, or backfilling, shall be performed beyond that specifically stated as a part of this subcontract unless pre approved by the Contractor.

B. Explosives (except as approved for demolition purposes), minors, domestic animals, firearms, alcohol, or drugs shall not be allowed on the site under any circumstances.

Part 2—Products

(Not Used)

Part 3—Execution

3.1 Scope of Work

The work shall consist of furnishing all labor, tools, equipment, materials, transportation, services and incidentals, and performing all operations necessary for the work as shown and noted on the drawings and as specified in these specifications and other applicable solicitation documents. To ensure completion of the project in accordance with the construction milestone schedule included with the solicitation documents, the subcontractor shall have labor and equipment resources available and dedicated to this subcontract.

All work shall be performed to meet the requirements of the Contractor's Health and Safety Plan for this area.

3.2 Subcontract Drawings

Call-out dimensions shown on the drawings take precedence over scaled dimensions. Large-scale details have precedence over smaller scale drawings or details.

3.3 Work Schedule

Work schedule at a minimum shall be Monday through Thursday; 10 hours per day. Any deviation from this schedule will need to be proposed to and approved by the Contractor. Friday may be used as an additional workday upon request by the subcontractor, in writing and a minimum of 1 week in advance. Subcontractor shall receive approval from Contractor prior to implementing the Friday work day.

3.4 Project Coordination

The subcontractor shall supervise and direct all work required under this subcontract. The subcontractor shall be solely responsible for the construction methods, controls, techniques, sequences, procedures, or construction safety, except as required by the subcontract documents or in cases where Contractor written direction to the subcontractor overrides the subcontractor's choice.

Part 4—Measurement and Payment

4.1 Measurement

(Not Used)

4.2 Payment

(Not Used)

End of Section 01010

Section 01020: Construction Health and Safety

Part 1—General

1.1 Scope

This section describes the project health and safety requirements. All work shall be conducted in accordance with safety regulations promulgated by the U.S. Department of Energy (DOE), the Occupational Safety and Health Administration (OSHA), these subcontract documents, and state and local agencies.

1.2 Integrated Safety Management

The Contractor will define, direct, and coordinate health and safety for all site activities. DOE and the Contractor are committed to systematically integrating environment, safety, and health management into all facets of work planning, practices, and execution at all levels, using an Integrated Safety Management System (ISMS) so that the work is accomplished while protecting the workers, the public, and the environment. For the purposes of integrated safety management, the definition of safety encompasses safety, health, and environmental protection, including pollution prevention and waste minimization. Subcontractor personnel, including lower-tier subcontractors, are responsible for following work instructions and procedures, and for taking precautions to prevent injury to themselves and others.

The Contractor will prepare a Job Safety Analysis (JSA) using the ISMS's Five Core Functions for work planning and control to define the scope of work and specific activities of this project, analyze the hazards identified with the activities, and develop and implement the hazard controls and/or protective equipment to mitigate those hazards. Subsequently, the subcontractor shall perform the work within the controls and provide feedback and continuous improvement. Subcontractor personnel shall review and understand the JSA prior to the start of work and add any additional identified hazards or concerns to the JSA, thereby integrating safety management into the workplace.

1.3 Worker Safety and Health Program Rule 10 CFR 851

The Contractor and its subcontractors are subject to the provisions of the OSHA Worker Safety and Health Program rule, Title 10, Section 851 of the *Code of Federal Regulations* (10 CFR 851), and are required to comply with the Contractor's Worker Safety and Health Program (WSHP). The WSHP describes the programs and procedures that the Contractor uses to ensure a safe work environment. The WSHP must be followed by the Contractor and its subcontractors for work performed at any DOE site. Not following the WSHP may result in penalty to a company or an employee.

The provisions of the WSHP relevant to the scope of work will be communicated to the subcontractor through the work control process, including the Preconstruction Conference, the Initial Site Briefing, and daily safety meetings, to ensure that all personnel understand the work scope, work sequence, associated hazards, hazard controls, safety equipment, and required procedures. All personnel will have an opportunity to question, comment on, and expand on hazard analyses and controls during the Preconstruction Conference, Initial Site Briefing, daily safety meetings, and other contact with Contractor staff.

A copy of the Contractor's WSHP is available by request. A copy of the Worker Safety and Health Program rule, 10 CFR 851, including its implementation requirements and penalty provisions, can be found at http://www.hss.doe.gov/HealthSafety/WSHP/rule851/851final.html.

1.4 Submittals

A. Submittals shall be made in accordance with Section 01300 (Submittals).

B. Submittals shall be made for proposed substitutions.

C. Submittals shall be made as required on the Project Submittal List, Table 01300–1.

D. Submit notification to the Contractor of all subcontractor or lower-tier subcontractor employees meeting the 240-hour criterion for a fitness-for-duty evaluation 5 working days prior to working on this subcontract per Article 3.3 of this section.

E. Submit completed Physical Examination Determination (PED) form (LMS 2115e_1) to the Contractor Occupational Medicine Coordinator (OMC) for each employee meeting the 240-hour criterion, per Article 3.3 of this section, 5 or more working days prior to performing any work.

F. Submit the Hour Tracking form (LMS 2119) to OccupationalProgram@Stoller.com monthly per Article 3.3 of this section.

G. Submit notification to the Contractor of all subcontractor or lower-tier subcontractor employees who are absent from work on DOE-controlled site(s) for 5 or more days, inclusively, due to illness or injury, whether the illness or injury is work-related or not on the fifth day. Those employees must receive a fitness-for-duty evaluation prior to returning to work, per Article 3.3 of this section.

H. Submit equipment operator qualifications per Article 3.4C.1 of this section at the Preconstruction Conference.

I. Submit the Subcontractor OSHA Competent Person Designation form attached to this section, per Article 3.4C.2 of this section at the Preconstruction Conference.

J. Submit a signed statement to document personnel proficiency to perform tasks and operate the equipment supplied under this subcontract per Article 3.4C.1 of this section at the Preconstruction Conference.

K. Submit subcontractor Material Safety Data Sheets (MSDS) per Article 3.9 of this section upon bringing material onto site.

L. Submit hoisting and rigging operator and equipment information and lift plan per Article 3.10C of this section.

M. Submit equipment list, the type of equipment used to transport, and the method for unloading (e.g., direct roll off, metal ramps, or temporary dirt ramps) per Article 3.10D.2 at the Preconstruction Conference.

N. Submit list of lower-tier subcontractors and suppliers per Article 3.13 of this section at the Preconstruction Conference. List shall be updated as lower-tier subcontractors or suppliers change.

O. Submit list of all lower-tier suppliers delivering to or transporting from the site at the Preconstruction Conference per Article 3.13 of this section. The list shall be updated as lower-tier suppliers change.

1.5 Related Work

Division 1 through 2 of these specifications.

Specific requirements for submittals not described in this section are described in related sections of these specifications and in the *Terms and Conditions for Construction Subcontracts* (Terms and Conditions).

1.6 Specifications, Codes, and Standards

The publications listed below form a part of this section to the extent referenced. The publications are referred to in the text by the basic designation only.

Code of Federal Regulations

10 CFR 851	Worker Safety and Health Program
29 CFR 1910	Occupational Safety and Health Standards and for General Industry and standards incorporated by reference
29 CFR 1926	Safety and Health Regulations for Construction and standards incorporated by reference

American National Standards Institute

ANSI Z41-1991	American National Standard for Personal Protection-Protective Footwear
ANSI Z87.1-2003	American National Standard for Occupational and

	Educational Eye and Face Protection Devices
ANSI Z89.1	American National Standard Requirements for Protective Headwear for Industrial Workers
National Fire Protection Association	
NFPA 70E	Standard for Electrical Safety in the Workplace

Part 2—Products

(Not Used)

Part 3—Execution

3.1 Worker Rights and Responsibilities

Workers are responsible for identifying safety concerns, potential hazards, or unsafe conditions to management. Each worker has the right, responsibility, and authority to report unsafe or environmentally unsound conditions or practices and stop work activities without fear of reprisal for the prevention of injuries or accidents. Prior to the start of work, all subcontractor and lower-tier subcontractor personnel shall read the attached Worker Safety and Health Poster, which outlines worker rights.

3.2 OSHA Compliance

The subcontractor and all lower-tier subcontractors shall comply with all applicable OSHA requirements identified under 29 CFR 1910 and 29 CFR 1926, as required by the Department of Occupational Safety and Health. In addition to complying with OSHA, subcontractor shall comply with all state and local health and safety regulations. The subcontractor shall have a Health and Safety Program in accordance with 29 CFR 1910 and 29 CFR 1926.

The subcontractor shall perform all work safely and in accordance with the requirements of the Rocky Flats Health and Safety Plan, the subcontractor's Health and Safety Plan (HASP), and any associated JSAs, safe work permits, and appropriate Federal and State health and safety regulations, such as those promulgated by OSHA. The subcontractor shall comply with the provisions in 29 CFR 1910.120 for all work performed at the Northeast and 4.5 Acre sites. In addition, the subcontractor shall follow the Contractor's site-specific procedure for lightning safety which can be found in the Rocky Flats Health and Safety Plan. No hoisting and rigging activities will allowed where the weight of the lift exceeds 75 percent of the capacity of the lifting equipment.

3.3 Fitness-for-Duty Evaluation

All subcontractor or lower-tier subcontractor employees who work on DOE-controlled site(s) for more than 240 hours in a 12-month period, inclusively, are required to have a fitness-for-duty evaluation. The site addressed in this SOW is a DOE-controlled site.

For each subcontractor or lower-tier subcontractor employee who is expected to exceed the 240-hour threshold, the subcontractor shall notify the Contractor 5 or more working days prior to performing any work on this subcontract, and shall complete the attached PED form. The subcontractor shall track employee workdays/hours on DOE projects and notify the OMC of all employees meeting this criterion. The attached Hour Tracking form needs to be submitted monthly. Please provide an accounting of all employees present on the site. This form can be sent to the OccupationalProgram@Stoller.com for record keeping.

The subcontractor shall submit the completed PED form to the OMC to be used to determine the type of physical examination required. Based on the evaluation of tasks performed, the OMC may direct various levels of physical exams. The subcontractor may be directed to use the services of the OMC to arrange for another licensed physician, other than one used for personal healthcare, to complete the fitness-for-duty evaluation. The completed PED form will either be returned to the subcontractor to be carried by the employee or sent directly to the medical examiner performing the examination. The subcontractor shall be compensated for examination costs directly related to this requirement if a physician is used outside of the National Network. Otherwise the Contractor is billed directly by contracted clinics and notification will be sent to Project Management and Accounting when the fitness-for-duty process is complete.

The employee shall take a copy of the attached Occupational Health Request form (LMS 2115e_2) to the physician/medical examiner. When the physician/medical examiner completes the examination and diagnostics, if applicable, the Occupational Health Request form will be forwarded to the OMC for subcontractor notification by the physician/medical examiner.

Subcontractor or lower-tier subcontractor employees will not be permitted to work on the site for more than 240 hours in a 12-month period without a fitness-for-duty examination on file with the OMC. Notification of approved fitness for duty by the OMC is needed prior to the 240-hour mark. Please contact the OccupationalProgram@Stoller.com before this event occurs to establish this process.

In addition, the subcontractor must notify the Contractor of any subcontractor or lower-tier subcontractor employee(s) who have been absent from work for 5 or more days, inclusively, due to any illness or injury, whether the illness or injury is work-related or not. Such employees shall not return to work without another fitness-for-duty evaluation.

The fitness-for-duty evaluation for employees who work on a Hazardous Waste Site, as defined in 29 CFR 1910.120, shall meet the requirements of 29 CFR 1910.120 and include a medical screening for the use of respiratory protective devices. This evaluation will be coordinated as described above. The OMC will determine if an examination that occurred in the 12 months prior to commencement of work will satisfy the requirement.

3.4 Training Requirements

Workers are responsible for performing tasks in accordance with provided training and may not perform tasks for which they have not been adequately trained. Minimum training requirements include the following:

A. Initial Site Briefing: All subcontractor field personnel shall attend a Contractor initial site briefing on the first day of work before conducting any field work. The briefing will be held when the subcontractor mobilizes to the site. If circumstances require the use of personnel who did not attend the initial site briefing, arrange individual briefings with the Contractor for the replacement personnel before they begin field work.

B. Tailgate Safety Meetings: At the beginning of each day's work, or at a frequency specified by the Contractor, and before specific tasks with significant or changed safety considerations, the Contractor and subcontractor shall conduct a health and safety and operations meeting for all personnel. The scope of the upcoming day's operations and activities will be reviewed, and hazards associated with those activities will be identified along with the safety implications and procedures to mitigate the hazards. Relevant safety documentation associated with the upcoming work will be reviewed. In addition, issues or concerns noted from the previous days' activities will be discussed. These briefings will be documented to identify the topics discussed and personnel in attendance (per Hazard Communication Standard, 29 CFR 1910.1200).

C. Personnel Qualifications

1. Qualified Operator/Laborers

   Provide personnel that are trained, qualified, professional, licensed, and certified as required to operate equipment or perform their tasks as required under this subcontract. Operators shall be qualified and experienced operating the equipment that they are assigned to and shall demonstrate proficiency on site. Submit a signed statement to document personnel proficiency to perform tasks and operate the equipment supplied under this subcontract at the Preconstruction Conference.

2. OSHA Competent Person

   For each phase of work, the subcontractor shall designate one trained, qualified, professional person from the personnel provided to act as a working Superintendent/Foreman/Lead Site Manager and provide subcontractor crew supervision. The individual shall also be designated as the OSHA competent

person. Provide name(s) of competent person(s) in accordance with OSHA regulations on the Subcontractor OSHA Competent Person Designation form attached to this specification. The identified OSHA competent person shall meet the requirements of a competent person for each OSHA component of the work (e.g., hoisting and rigging, scaffolding, electrical, excavations). The form shall be updated as the project progresses and changes in personnel occur and specialized phases of the work required are initiated.

3.5 Jobsite Inspections

The subcontractor shall conduct daily inspections of the jobsite for unsafe conditions or practices. The inspection shall be documented and made available for review by the Contractor on a daily basis. Corrective action shall be taken to mitigate hazardous jobsite conditions. The subcontractor shall inspect vehicles, heavy equipment, and materials prior to mobilization to the site to ensure that the equipment and materials comply with and meet the manufactures safety and operating requirements and applicable regulatory standards—including OSHA, State of Colorado Department of Transportation, and DOE requirements. The subcontractor shall make vehicles, heavy equipment, and materials available to the Contractor for an initial safety and radiological inspection prior to commencement of work. The subcontractor shall allow up to 1 workday for the Contractor to conduct the initial inspection and up to 1 workday for each piece of equipment delivered to the jobsite after work has begun at the site. If vehicles, heavy equipment, or materials do not meet the manufactures safety and operating requirements and applicable regulatory standards the vehicles, heavy equipment, or materials shall not be used on a jobsite until approved by the Contractor.

3.6 Work Clothing and Personal Protective Equipment

A. Work Clothing

1. Clothing such as tank tops, shirts cut off at the midriff, cut-off pants, shorts, sandals, sneakers, and jogging shoes are considered unacceptable dress and shall not be worn.

2. Adequate dress for personnel on a jobsite shall consist of the following:
   a. Full-length trousers, slacks, or jeans in good condition.
   b. Safety boots with sturdy soles that meet the requirements of ANSI Z41.
   c. Shirts that cover the shoulders, with sleeves at least T-shirt length.
   d. Leather, cotton, or synthetic work gloves when required to protect from abrasions, cuts, bruises, and to enhance the ability to safely grasp objects.

B. Personal Protective Equipment

1. The subcontractor shall be responsible for providing personal protective equipment (PPE) to the workers. This equipment includes, but is not limited to, the following:

   a. Safety glasses, with side shields or wraparounds when required, that meet the requirements of ANSI Z87.1A.

   b. Hardhats that meet the requirements of ANSI Z89.1.

   c. Hearing protection, required when a noise level equals or exceeds an 8-hour time-weighted average (TWA) sound level of 85 dBA.

   d. Full-face shields with safety glasses for any equipment that produces flying particles and/or sparks.

   e. High-visibility traffic vests.

2. The requirement for specific PPE, including when to wear it, will be determined by the Contractor in the JSA or Safe Work Permit for specific tasks. The Contractor reserves the right to adjust PPE requirements to protect personnel from hazards.

3. Radiological PPE required in these specifications shall be worn with at least modesty clothing (e.g., undershirts, smocks, swim shorts, shorts, leggings) underneath. Modesty clothing will not be provided by the Contractor.

3.7 Industrial Hygiene

A. Sanitation

The subcontractor shall provide a chemical toilet and hand-washing station at the worksite. During winter operating conditions, liquid hand cleaner will be provided. The subcontractor shall ensure that washing facilities meeting the following criteria are available for employees:

- The facility must use potable water. Potable wash-water containers shall be clearly marked for exclusive use as wash-water containers and include prohibition of use for drinking. Hand soap or similar cleansing agents shall be available.
- Individual hand towels, cloth, or paper shall be available in the immediate vicinity of the temporary toilet facility, and a receptacle for used towels shall be provided.

B. Drinking Water

The subcontractor shall provide bottled water or potable drinking water in a clean, sanitary vessel with individual drinking cups. A receptacle for disposing of the used cups or bottles shall be provided (29 CFR 1926.51(a)(5)). The subcontractor shall provide:

- Potable water adequate for the number of personnel at the site.
- Potable water containers equipped with tight-fitting caps.
- Water dispensers (if used) equipped with a tap to dispense the water. Water shall not be dipped from the container.
- Containers used to dispense drinking water, clearly marked for exclusive use as drinking water containers.
- Single-serve disposable cups, with a sanitary container for the unused cups and a receptacle for the used cups.

3.8 Environmental Hazards

A. Heat Stress

1. Hazards related to heat stress can be controlled through proper planning and effective monitoring of personnel. Factors that could affect a worker's ability to function in extreme temperatures include PPE, physical fitness, acclimatization, age, obesity, alcohol consumption, drug use, infections, and disease. Personnel could potentially be exposed to heat stress conditions when ambient temperature exceeds 70 °F because of factors such as high humidity, low air movement, high radiant heat, and level of physical activity of the worker.

2. Because of the concern about heat stress, the Contractor recommends that the subcontractor train employees to recognize the signs of heat stress, monitor employees for symptoms, and take appropriate action, including initiating a work-rest schedule, if the symptoms are present. The actual work-rest schedule will be determined by conducting pulse monitoring after each work period. When a person's pulse exceeds 110 beats per minute, the individual is undergoing heat stress that will require reducing the work period by one-third while maintaining the same rest period (15 minutes) until pulse monitoring during the post-work period is maintained below 110 beats per minute. If heat stress is not indicated, work periods may be lengthened. Pulse rate should be monitored at 150-minute intervals when the temperature at the work site reaches 77 °F, and frequency should increase as the temperature rises. Pulse rate should be monitored every 45 minutes at a temperature of 90 °F. If an employee shows frequent signs of heat stress on the jobsite, an oral temperature measurement should be taken with a thermometer. A body temperature of 99.6 °F or greater indicates heat stress and requires further reduction in the work time.

B. Cold Exposure

1. In cold surroundings, shivering increases the metabolic heat production, but the feet, face, and hands can still feel cold. This is often a confusing situation because the individual can be warmly clothed, with portions of the body becoming overheated while the extremities remain cold. The regulation of blood flow and sweating cannot keep all parts of the body in uniform thermal balance. Clothing must be appropriate to obtain uniform thermal balance.

2. In cold environments, windchill temperature is a better description of thermal conditions than the ambient temperature alone. The wind adds to the rate of cooling, and it is the combination of wind speed and air temperature that is most important. For example, at a windchill temperature of –25 °F (from a 5 °F temperature and 15 mile-per-hour wind), exposed flesh can freeze within 1 minute (see Table 01020–1). However, fingers, toes, nose tips, ears, or cheeks can become frostbitten at ambient temperatures as high as 28 °F in high winds. This is approximately the freezing point of skin.

Table 01020–1. Windchill Index

Wind Speed (mph)	**Actual Thermometer Reading (°F)**								
	40	30	20	10	0	-10	-20	-30	-40
	Equivalent Temperature (°F)								
calm	40	30	20	10	0	-10	-20	-30	-40
5	36	25	13	1	-11	-22	-34	-46	-57
10	34	21	9	-4	-16	-28	-41	-53	-66
15	32	19	6	-7	-19	-32	-45	-58	-71
20	30	17	4	-9	-22	-35	-48	-61	-74
25	29	16	3	-11	-24	-37	-51	-64	-78
30	28	15	1	-12	-26	-39	-53	-67	-80
35	28	14	0	-14	-27	-41	-55	-69	-82
40	27	13	-1	-15	-29	-43	-57	-71	-84
Over 40 mph (little added effect)	**Frostbite Times**				**30 min.**	**10 min.**		**5 min.**	
	Wind Chill (°F) = 35.74 + 0.6215T – 35.75($V^{0.16}$) + 0.4275T($V^{0.16}$) Where, T = Air Temperature (°F) V = Wind Speed (mph)								

C. Lightning

1. When an electrical storm is close enough to the work site to be a hazard to site employees, personnel shall seek shelter in buildings, vehicles, equipment with cabs, low areas, or ground depressions and remain there until the Contractor authorizes the resumption of work. Arroyos and other drainages are not suitable because of potential for flash flooding.

2. **Option 1.** The flash-bang method involves counting the time from seeing a flash of lightning to hearing the thunder. For each 5-second count, lightning is approximately 1 mile away. The flash-bang method will be used to determine if

work will be halted. When the time interval is less than 5 seconds, the site will be shut down and reassessed every 30 minutes.

3. **Option 2.** The subcontractor shall follow the Contractor's site-specific procedure for lightning safety.

D. Biological Hazards

Be aware of the possibility of insect, reptile, and animal bites, including spiders, snakes, rabbits, mice, etc. Because of the increased incidence of hantavirus, avoid contact with animal droppings and notify the Contractor of any evidence of rodent infestation. This could include droppings, nesting materials, etc.

E. Excavations

Excavations shall not exceed 4 feet in depth without proper consideration to soil types by competent person in accordance with OSHA.

3.9 Material Safety Data Sheets

The subcontractor shall submit to the Contractor a copy of the MSDS for each chemical the subcontractor intends to use on the jobsite. MSDS books shall be provided by and made available by the subcontractor. The book shall contain only the MSDS for the chemicals used on the site. The books must be clearly marked and placed in a convenient location for all personnel to access.

3.10 Industrial Safety Requirements

A. Hearing Conservation

Hearing protection shall be worn in areas if a noise level equals or exceeds an 8-hour TWA sound level of 85 dBA. If sound level surveys are not available, hearing protection with a noise-reduction rating of 25 shall be worn whenever motorized equipment is operating in the immediate area or when the Contractor suspects the sound levels exceed the action level. The subcontractor shall comply with OSHA standard 29 CFR 1910.95.

B. Safe Work Permits

The safe work permit shall be used for non-routine jobs that are not covered by a written procedure or JSA. The Contractor may require safe work permits for tasks such as cutting/welding, using chainsaws, or working on energized electrical lines. A 24-hour notice is required prior to issuance of any safe work permit.

C. Heavy Equipment Unloading

1. Heavy equipment shall not be unloaded until the unloading portion of the JSA has been reviewed and understood for this activity.

2. Subcontractor shall notify the Contractor 1 day prior to equipment being unloaded and shall provide the following information to the Contractor:

   a. Type of equipment being unloaded.

   b. Type of equipment transport.

   c. Method for unloading (for example, direct roll off, metal ramps, or temporary dirt ramps).

3. Equipment shall only be unloaded with the Contractor present.

D. Equipment Use

All tools and equipment shall be operated as specified in their operating manuals.

E. Electrical Safety

All electrical installations shall be performed by qualified, trained, professional personnel and under the supervision of a licensed electrical contractor in the State of Colorado. Electrical work shall be performed in accordance with Subpart K of 29 CFR 1926 and National Fire Protection Agency (NFPA) Standard 70E.

All electrical work shall comply with Attachment B to this section: Standard 10.2 "Lockout/Tagout for Energy Control." Associated forms will be provided prior to project commencing.

F. Emergency Response

The Site-Specific Emergency Response Information for this project is included with this solicitation.

G. Radioactive Sources

Radioactive sources, including radiography sources and radiation generating devices, shall not be brought on a jobsite by the subcontractor without prior notification to the Contractor Radiological Control Manager. Radioactive sources shall be identified by serial number, isotope, and the most current integrity test.

3.11 Accident Reporting

The subcontractor shall immediately report to the Contractor any accident, incident, or near miss that could affect the health and safety of the site workers or general public involving personal injury or property damage, however minor, as well as any illness or injury known or suspected to have an occupational cause. The subcontractor shall immediately secure the equipment and/or work site involved in an accident, event, or near miss until the Contractor grants permission to return to work. The subcontractor shall cooperate fully with Contractor and DOE personnel in any investigation of an accident, illness, or injury.

3.12 Records

The Contractor may require the subcontractor to record, on a Contractor-supplied Site Entrance Log, the names of all persons entering or exiting the jobsite each day. These logs, if required, shall be filed at the Contractor's office after completion of the project. All records shall be controlled by the Contractor.

3.13 Lower-Tier Subcontractors

The subcontractor shall notify the Contractor of any lower-tier subcontractors working on the site or suppliers delivering to or from the site. The subcontractor shall ensure that lower-tier subcontract documents contain applicable health and safety flow-down requirements and that those requirements are enforced. The information and ratings provided from the OSHA 300 Log, OSHA 300A Log, and Experience Modification Rate for lower-tier subcontractors must be acceptable and approved by the Contractor prior to their start of work.

Part 4—Measurement and Payment

4.1 Measurement

(Not Used)

4.2 Payment

No separate payment shall be made for the items required in the Construction Health and Safety section unless otherwise provided for payment by separate items in the Unit Price Schedule. Full compensation for such work shall be considered incidental to completing the project.

End of Section 01020

Subcontractor OSHA Competent Person Designation

The following individual(s) representing _____ are designated as the *OSHA*
Company Name
Competent Person, and are capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to personnel on the site or the public, and has authorization to take prompt corrective measures including "stop work" authority to eliminate them, while overseeing the specific work scope outline in this subcontract.

1. Competent Person _____ _____
Name *Date*

Descending order of Designated Competent Person in Line 1's or 2's absence:

2. _____ _____
Name *Date*

3. _____ _____
Name *Date*

1. Specialized Work Competent Person:

_____ _____
Name *Date*

_____
Type of Work

Subcontractor Superintendent/Foreman/Lead Site Manager Acknowledgement of Understanding

I, _____ designated as the assigned on-site subcontractor
Name
Superintendent/Foreman/Lead Site Manager for Subcontract No. _____ acknowledge that I have read and understand the subcontract documents relative to the scope of work for this project.

_____
Superintendent/Foreman/Lead Site Manager Signature

_____
Company

_____
Date

Hour Tracking

As previously stated in your Statement of Work package:

Prior to commencing work, all subcontractor or lower-tier subcontractor employees who work at DOE controlled site(s) for more than 240 hours in a 12-month period are required to have a fitness for duty evaluation. **The subcontractor shall track employee work hours on DOE projects and notify the Stoller Contract Administrator and Occupational Program Coordinator of all employees meeting this criteria.** Note: the 12-month period is a rolling 12-month period that may span two calendar years, not a calendar year.

This form is to be submitted on a monthly basis for all current and projected employees who will meet the 10 CFR 851 standard. E-mail your employee's hours to OccupationalProgram@stoller.com for tracking. Please list employees on more than one project separately for each project. Contact Michelle Grimaldo, Occupational Program Coordinator at (303) 546-4322 if you have any questions.

Subcontractor: _____ Project(s): _____

_____

Employee	Location/Project	Week of	Hours

Should you require more space please make additional copies as needed.

U.S. Department of Energy Office of Legacy Management

Physical Examination Determination (Job/Category Site Form)

Name: _____ Date: _____

Position: _____ Company: _____

Job Site: _____ Charge Number: _____

Subcontract Number: _____

Please consider current and potential work for the above-named person when filling out this form. Check appropriate category.

☐ **SEDENTARY WORK**—Exerting up to 10 pounds of force occasionally and/or a negligible amount of force frequently or constantly to lift, carry, push, pull or otherwise move objects, including the human body. Sedentary work involves sitting most of the time, but may involve walking or standing for brief periods of time. Jobs are sedentary if walking and standing are required only occasionally and all other sedentary criteria are met.

☐ **LIGHT WORK**—Exerting up to 20 pounds of force occasionally and/or up to 10 pounds of force frequently, and/or negligible amount of force constantly to move objects. Physical demand requirements are in excess of those for sedentary work. Light work usually requires walking or standing to a significant degree. However, if the use of the arm and/or leg controls requires exertion of forces greater than that for sedentary work, and the worker sits most of the time, the job is rated light work.

☐ **MEDIUM WORK**—Exerting up to 50 pounds of force occasionally, and/or up to 20 pounds of force frequently, and/or up to 10 pounds of force constantly to move objects. Frequent squatting, bending, and/or stooping. Occasional work on uneven surfaces.

☐ **HEAVY WORK**—Exerting up to 100 pounds of force occasionally, and/or up to 50 pounds of force frequently, and/or up to 20 pounds of force constantly to move objects. Frequent squatting, bending, and/or stooping. Work on uneven surfaces more than occasionally.

☐ **VERY HEAVY WORK**—Exerting in excess of 100 pounds of force occasionally, and/or in excess of 50 pounds of force frequently, and/or in excess of 20 pounds of force constantly to move objects. Frequent squatting, bending, and/or stooping. Frequent work on uneven surfaces.

Work Conditions and/or Hazards: Please check all that apply.

Minimal	Moderate	Significant
☐ Site Walkdowns	☐ Activity >8hr/D	☐ Activity >10hr/D
☐ Environmental Sampling	☐ Sm Machinery/Tool Use	☐ Heavy Machinery Use
☐ Weather Exposure	☐ Mod Noise >85 dBA 8hr/D	☐ Noise >90 dBA >8hr/D
	☐ Temp <32 >85 Occasionally	☐ Temp <32 >85 Mostly

Check All Additional Needs:

Exposure to Hazardous Material	☐ Possible	☐ Likely	☐ Known
Type: _____			
Confined Space Work	☐ Possible	☐ Likely	☐ Known
Respirator Use	☐ Possible	☐ Likely	☐ Known
Type Needed: _____			
Need for CDL	☐ Possible	☐ Likely	☐ Known
Respirable Environment (examples: chemical, dust, fumes, mists)	☐ Possible	☐ Likely	☐ Known
Security Guard Duties	☐ Possible	☐ Likely	☐ Known

Project Manager/Date | Occupational Program Coordinator/Date | Health and Safety Representative/Date

U.S. Department of Energy Office of Legacy Management

Occupational Health Exam Request

Dear Subcontractor and Employee: Below is the testing you will need completed prior to starting work on the site in accordance with 10 CFR 851 and/or post-job offer. Please expedite this matter as soon as possible. Your supervisor, project manager, or HR representative will be notified upon completion of the testing. Any questions please contact:

Occupational Program Coordinator: Robin Cyr Phone: (970) 248-6651 Fax: (970) 248-6165

Please take this form with you to examination. Sign below to acknowledge receipt of this form.

The box(es) checked indicates the request. Any additional testing requires authorization or is to be done at the discretion of the MD with validation in the dictation.

☐ **Drug Test 5 Panel** (can be done before exam date if needed)

☐ **Basic Exam** (FFD/Entrance/Exit)
(Hgt/Wgt, VS, Exam, Rev of Med/Occupational Hx, Urine dip)

☐ **DOT/CDL**

☐ **Hazwoper/Hazmat**

Additional Needs:

☐ CBC w/DIFF

☐ Lipid Panel

☐ Lift Test ☐ >50#

☐ EKG

☐ Chest X-Ray ☐ B Read

☐ Audiogram

☐ Vision

☐ Pulmonary Function

☐ Chemistry Profile

I, _____, do hereby acknowledge receipt of this form and others that have been provided for the purpose of either fit-for-duty testing and/or post-offer. I, _____, do also release those forms for the purpose of review and to place in my medical file.

_____ _____
Signature and Printed Name Date

You Have a Right to a Safe and Healthful Workplace

IT'S THE LAW!

- You have the right to notify your employer or the local Department of Energy (DOE) office about workplace hazards, without reprisal. You may ask that your name not be used.
- You have the right to participate in the activities referenced in 10 CFR 851 "Worker Safety and Health Program," on official time.
- You have the right to access copies of DOE worker protection publications; the worker safety and health program for your workplace; and the standards, controls, and procedures that apply to your workplace.
- You have the right to have access to some accident and illness recordkeeping logs and the information in records of any workplace illness or injury that you experienced.
- You have the right to observe monitoring or measuring of hazardous agents, to receive the results of your own monitoring, and be notified when monitoring results indicate an overexposure.
- You have the right to have a representative accompany the DOE's Director for enforcement or the Director's authorized personnel during the inspection of your workplace.
- You have the right to request and receive results of inspections and accident investigations.
- You have the right to decline to perform an assigned task because of your reasonable belief that, under the circumstances, the task poses an imminent risk of death or serious physical harm to you, coupled with your reasonable belief that there is insufficient time to seek effective redress through the normal hazard reporting and abatement procedures.
- Your employer must post this notice in your workplace.

Title 10 CFR 851 requires DOE contractors to provide their workers with a safe and healthful workplace. To obtain more information about those requirements and your rights, seek advice or assistance, or report an emergency, contact your supervisor, the DOE Grand Junction office, or the DOE Office of Health, Safety and Security (http://www.hss.energy.gov). Additional inquiries or concerns may be addressed to the DOE Safety and Health Manager at the DOE Grand Junction office, 2597 B 3/4 Road, Grand Junction, CO 81503.

Section 01050: Field Engineering

Part 1—General

1.1 Scope

This section specifies the requirements for surveying and layout work.

A. Subcontractor Responsibilities

The subcontractor shall stake all construction points to ensure the work is completed to the required lines and grades.

B. Contractor Responsibilities

1. The Contractor will provide all staking showing the Preble's habitat boundary as indicated on the drawings.

2. The Contractor will provide clarification of any work in question. If any line or grade is in question, the subcontractor shall not proceed until written clarification/response is received.

1.2 Related Work

A. Section 01300—Submittals

B. Section 02200—Earthwork: Excavation, Backfill, and Disposal

1.3 Submittals

A. Submittals shall be made in accordance with Section 01300 (Submittals).

B. Submittals shall be made for proposed substitutions.

C. Submittals shall be made as required on the Project Submittal List, Table 01300–1.

D. The subcontractor shall submit quantity documentation for unit-priced work to support quantities indicated on pay applications.

E. Submit lead site surveyor, name, registration number, and professional surveyor resume of qualifications per Article 1.4A of this section.

1.4 Quality Assurance

A. The subcontractor shall provide experienced construction surveyors. All survey and layout work performed by the subcontractor shall be performed under the supervision and direction of a licensed land surveyor. The licensed surveyor shall

have a minimum of 3 years experience in construction surveys for construction work similar in nature to that required by the project. The subcontractor shall maintain sufficient qualified personnel to perform required surveying work. All survey work shall be subject to review by the Contractor.

B. The subcontractor instruments and other survey equipment shall be accurate, suitable for the surveys required in accordance with recognized professional standards, and in proper condition and adjustment at all times. Any equipment found to be inaccurate (beyond allowable tolerances) or defective shall immediately be repaired or removed from the job site by the subcontractor at no additional cost to the Contractor.

Part 2—Products

(Not Used)

Part 3—Execution

3.1 Field Measurement

A. Field tape-measurements may be allowed to document installed quantities for use as payment application backup at the discretion of the Contractor.

B. Tolerances in survey layout of work shall not exceed the following:

Types of Line or Mark	Horizontal Position	Elevation
Permanent reference points, control points, and survey control points.	1 in 10,000	± 0.02 feet (ft)
Reference points for general excavation and earthwork grade staking.	1 in 2,000	± 0.10 ft

The Contractor may perform field surveys to verify that the subcontractor's field survey work is within acceptable tolerances and accurately depicts requirements of the drawings and these specifications. In the event that the Contractor's survey differs from the subcontractor's survey, the Contractor's survey shall govern.

3.2 Establishing and Maintaining Lines and Grades

A. Subcontractor

1. Before commencing any layout of work and surveys, the subcontractor shall provide verbal notice to the Contractor so the Contractor may witness or independently check such work.

2. The subcontractor shall secure all field measurements required for proper installation of the work included in this subcontract. Exact measurements are the subcontractor's responsibility.

3.3 Quantity Documentation

Prior to payment for applicable work, the Contractor will provide to the subcontractor documentation of work quantity estimates.

Part 4—Measurement and Payment

4.1 Measurement

(Not Used)

4.2 Payment

(Not Used)

End of Section 01050

Section 01060: Compliance with Codes and Standards

Part 1—General

1.1 Scope

Work under this project shall comply with the following codes and standards and all other applicable federal, state, and local codes, standards, rules, and regulations.

1.2 Related Work

Divisions 1 through 16 of these specifications

1.3 Submittals

A. Submittals shall be made in accordance with Section 01300 (Submittals).

B. Submittals shall be made for proposed substitutions.

C. Submittals shall be made as required on the Project Submittal List, Table 01300–1.

D. Submit copies of all permits, complete with approval signatures, obtained for the project immediately upon receipt.

1.4 Specifications, Codes, and Standards

The publications listed below form a part of this section to the extent referenced. The publications are referenced in the text by the basic designations only.

Code of Federal Regulations (CFR)

Title 29, Labor

Part 1910, "Occupational Safety and Health Standards"
Part 1926, "Safety and Health Regulations for Construction"

American Association of State Highway and Transportation Officials (AASHTO)

Federal Specifications (FS)

Geosynthetic Research Institute (GRI)

Federal Standards (FED-STD)

Occupational Safety and Health Administration (OSHA) Regulations

Part 2—Products

(Not Used)

Part 3—Execution

Compliance with Codes and Standards

The subcontractor and lower-tier subcontractors shall comply with codes and standards noted above and as noted in other sections of these specifications and on the drawings.

Part 4—Measurement and Payment

4.1 Measurement

(Not Used)

4.2 Payment

(Not Used)

End of Section 01060

Section 01200: Environmental Compliance

Part 1—General

1.1 Scope

This section describes the following project-specific requirements and procedures.

A. Cultural Resources

B. Environmental Requirements

C. Dust Control

D. Site Water Management

E. Storm Water Controls

F. Preble Mouse Habitat/Wetlands

1.2 Related Work

Divisions 1 and 2 of these specifications

1.3 Submittals

A. Submittals shall be made in accordance with Section 01300 (Submittals).

B. Submittals shall be made for proposed substitutions.

C. Submittals shall be made as required on the Project Submittal List, Table 01300–1.

Part 2—Products

Environmentally preferred products shall be used for construction activities when economically feasible to achieve comparable results.

Part 3—Execution

3.1 Cultural Resources

If cultural resources or human remains are unearthed during operations, activity in the vicinity of the cultural resource will cease, and the subcontractor shall notify the Contractor immediately. The subcontractor on-site manager is responsible for informing all persons associated with this project that they will be subject to prosecution for

knowingly disturbing historic and prehistoric archaeology sites or for collecting artifacts of any kind, including historic items, arrowheads, and/or pottery fragments.

3.2 Environmental Requirements

A. Environmental Management System

In accordance with U.S. Department of Energy (DOE) Office of Legacy Management's (LM's) Environment, Safety, and Health Policy and Environmental Management System, all subcontractors performing work for DOE-LM through its Contractor, S.M. Stoller Corporation, shall follow safe and environmentally sound work practices. Work shall be conducted in compliance with applicable federal, state, and local regulatory requirements and DOE directives and in a manner that protects workers and the public. In addition, work must be conducted in a manner that prevents pollution, minimizes wastes, and conserves natural and cultural resources to the extent that such activities are technically and economically feasible. Subcontractor personnel are responsible for informing Contractor of any unsafe or environmentally unsound conditions, and have the authority to stop work without fear of reprisal if necessitated by such conditions.

B. Waste Management

The subcontractor shall properly manage all non-hazardous and hazardous waste that it generates. The subcontractor shall maintain the Site in a clean and orderly manner at all times and clean up debris and waste material from the Site daily. Construction debris and non-hazardous waste material shall be disposed of in a receptacle provided by the subcontractor. Hazardous waste shall be managed, including storage, transport, and offsite disposal, in compliance with applicable federal, state, and local regulations.

C. Spills

If the subcontractor spills any fluids from equipment operations or maintenance (fuel, hydraulic fluids, coolant, lubricants, cleaning solvents, used oil, etc.), the subcontractor shall immediately notify the Contractor and follow the Contractor's directions to clean up the spill. Equipment leaks and other types of spills shall be diapered or otherwise blocked to prevent ground surface contamination until the leak is fixed. The subcontractor shall clean up and subsequently manage spilled materials and associated wastes (e.g., contaminated soils), including storage, transport, and offsite disposal, in compliance with applicable federal, state, and local regulations at the subcontractor's expense.

3.3 Dust Control

A. Visible dust shall not be allowed. The subcontractor shall take measures to control dust within the construction boundaries shown on the drawings. Dust suppression shall include all roadways, soil stockpiles, and other areas disturbed by the subcontractor.

B. The subcontractor shall take necessary measures to suppress visible dust. The subcontractor may use techniques that include, but are not limited to, the following:

1. Minimizing exposed earth work areas.

2. Enforcing lower speed limits (15 mph maximum) on all vehicles traveling within the site.

3. Suppressing dust by spraying the area with water or a Contractor-accepted dust retardant, such as calcium chloride or magnesium chloride.

4. Maintaining adequate moisture contest at all times in areas where the pre-existing surface have been removed or disturbed, and in material that have been stockpiled on the job site so that dust shall not be generated.

3.4 Site Water Management

A. The subcontractor shall control and manage storm water runoff, water used for dust control, and water from testing and cleaning activities.

B. The subcontractor shall install temporary drainage piping or swales to control overland flow, and to route natural and man-made drainage under temporary roadways, if necessary. The subcontractor shall select the size and type of piping or swale to be used, and shall be responsible for the performance. The subcontractor shall provide adequate fill over piping and compact materials around the drainage piping to protect the pipe. The subcontractor shall perform regular maintenance of any temporary drainage system as necessary to prevent plugging or reduced capacity.

3.5 Storm Water Permit and Pollution Prevention Plan and Erosion-Control Measures

The subcontractor shall follow the requirements of the Contractor's *Storm Water Pollution Prevention Plan* (SWPPP) and *Erosion Control Guidelines* for the Project provided by the Contractor and implement prior to any work starting. Subcontractor shall prevent offsite movement of sediment from sediment sources during normal storm events and during dust control applications of water. Erosion control measures shall include use of straw bales and wattles, as required in Section 02920 and in the BMP's listed in the SWPPP.

3.6 Preble Mouse Habitat/Wetlands (Rocky Flats Site only)

At Locations B, C, and J either Preble's mouse and/or wetland habitat is adjacent to the roads where work is being conducted. The Contractor requires special erosion control measures at these locations per regulatory requirements, agreements, and permits. Implementation of these requirements are outlined in Section 2920 and the SWPPP.

Work in Preble's Mouse habitat requires prior consultation with U.S. Fish and Wildlife Services which will be completed by the Contractor prior to work commencing.

Part 4—Measurement and Payment

4.1 Measurement

(Not Used)

4.2 Payment

No separate payment will be made for the items required in this section, unless otherwise provided for by separate items in the unit-price schedule. Full compensation for such work will be considered incidental to completion of the project and shall be included in the most applicable related unit-price item.

End of Section 01200

Section 01300: Submittals

Part 1—General

1.1 Scope

The subcontractor shall provide submittals required by the subcontract documents in accordance with this section and revise and resubmit items, as necessary, to establish compliance with the specified requirements.

1.2 Related Work

Division 1 through 2 of these specifications.

Specific requirements for submittals not described in this section are described in related sections of these specifications and in the *Terms and Conditions for Construction Subcontracts* (Terms and Conditions).

1.3 Submittals

Provide submittals required in Table 01300–1. Subcontractor shall submit only one product proposal to meet a specific use. Contractor will not review multiple proposed products to determine if they will meet specifications.

1.4 General Submittal Requirements

A. Submittals are classified as follows:

1. For Review: Review is required for extensions of design, critical materials, proposed approved equal material substitutions, deviations, equipment that must be checked, compatibility with the entire system, and other items as designated in these specifications that require Contractor review.

2. For Information Only: All submittals not requiring Contractor review will be for information only.

B. The Contractor's review of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing, and other information are satisfactory. Review will not relieve the subcontractor of responsibility for any error or defect in the work. The subcontractor, under the quality control requirements of this subcontract, shall be responsible for dimensions, the design of adequate connections and details (not specified by the Contractor or subcontract documents), and the satisfactory construction of all work. After submittals are reviewed by the Contractor, no resubmittal for the purpose of substituting materials or equipment will be considered unless the submittal is accompanied by a written explanation of why a substitution is necessary.

C. The requirements specified in this section are supplemental to the requirements specified in the Terms and Conditions and any requirements specified in other sections.

D. All submittals shall be legible, reproducible, and in the English language.

E. All submittals shall be submitted directly to the Contractor from the subcontractor. Submittals directly from lower-tier subcontractors, suppliers, or manufacturers will not be accepted.

F. The subcontractor shall provide submittals far enough in advance of scheduled installation dates to provide time required for reviews, securing necessary acceptance, possible revisions and resubmittals, and for placing orders and securing delivery. If the subcontractor response to Contractor questions and comments regarding any submittal is not acceptable, any resulting delays in the project progress are the sole responsibility of the subcontractor and all required actions to accelerate the schedule to correct for delays shall be implemented by the subcontractor at no additional cost to the Contractor.

G. Unless otherwise specified, allow 5 calendar days for review by the Contractor following receipt of the original submittal and any subsequent resubmittal or modifications of previously accepted submittals.

H. All copies of all submittals shall be delivered to the Contractor at the following address:

Contract Administrator
S.M. Stoller
2597 B 3/4 Road
Grand Junction, CO 81503

Each submittal shall be accompanied by a letter of transmittal showing all information required for identification and checking. A sample letter of transmittal (Figure 01300–1) is included at the end of this section.

I. The Contractor will return one copy of the submittal as an attachment to the Contractor's review comments. The subcontractor may make and distribute copies as needed.

J. The subcontractor shall use the submittal identification number indicated in Table 01300–1. Submittals shall satisfy the following requirements:

1. Each submittal shall be referenced to the appropriate sheet number and detail; and specification section and paragraph to indicate compliance with the subcontract documents.

2. Resubmittals shall use the same submittal identification number as the original submittal except that a revision extension shall be added to the original

submittal identifications number. For example, an original submittal with identification number 16 and submittal number 16.00 shall have subsequent resubmittal numbers of 16.01, 16.02, etc.

3. All pages and/or pieces of each submittal as parts of the same submittal shall be identified by marking the submittal number on all individual parts of the submittal along with the total number of pages/pieces in the submittal. For example, a first revision of an original submittal with identification number 16 and submittal number 16.01 shall contain the following markings located as a header or footnote in an open portion of the submittal document, on page 3: "Submittal 16.01, page 3 of 6."

K. The subcontractor shall notify the Contractor in writing at the time of submittal of deviations in submittals from requirements of the subcontract documents. The Contractor reserves the right to accept or reject deviations from the subcontract documents.

L. The Contractor will clearly label the submittals with one of the following designations and return it to the subcontractor:

1. NO EXCEPTIONS TAKEN

2. FURNISH AS CORRECTED

3. AMEND AND RESUBMIT

4. REJECTED

M. Submittals returned marked "NO EXCEPTIONS TAKEN" and "FURNISH AS CORRECTED" do not constitute a waiver of detailed or specified requirements unless so stated in writing by the Contractor.

N. The subcontractor shall make all corrections required by the Contractor and promptly furnish a corrected submittal in the form and number of copies as specified for the original submittal. No payment for completed work will be made by the Contractor until after all relevant and required submittals have been delivered to, and accepted by, the Contractor.

1.5 Technical Submittals

Technical submittals include all required submittals not identified as a schedule or as a submittal for information only.

O. Product Data

1. Where contents of submitted literature from manufacturers include data not pertinent to the submittal, the subcontractor shall clearly show those portions of the contents that are being submitted for review.

2. The subcontractor shall submit copies of product data to identify applicable products, models, options, and other data. Manufacturer's standard data shall be supplemented to provide information unique to the work.

P. Certificates of Compliance: Certificates of compliance shall clearly identify the applicable materials and reference the applicable sections of the subcontract documents.

Q. Manufacturer's Instructions: The subcontractor shall submit manufacturer's warranty requirements, such as specific instructions for delivery, storage, shelf life, assembly, installation, adjusting, and finishing. The subcontractor shall submit manufacturer's instructions as required in relevant sections of these specifications.

1.6 Submittal Quality Control

A. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted. Review all submittals from lower-tier subcontractors and suppliers for compliance with the subcontract documents. Verify field measurements, field construction requirements, and material certification or identification numbers. Correct defective or incomplete submittals prior to forwarding them to the Contractor.

B. Verify that each item in the submittal conforms in all respects to the specified requirements.

C. By affixing the subcontractor's signature to each submittal, the subcontractor certifies that this coordination has been performed.

Part 2—Products

(Not Used)

Part 3—Execution

3.1 Submittal List

A. Table 01300–1 is a list of submittals required by these specifications. The submittals listed in Table 01300–1 include both specific and general types of submittals; for example, Table 01300–1 shows submittal requirements for certifications and product data, but does not show all of the specific items for which certifications or product data are required.

B. The "No. of Copies" column in Table 01300–1 includes one copy of submittals that will be returned to the subcontractor for submittals that require Contractor review.

The number of copies shown for submittals that are for information only include only the number of copies that are required for retention by the Contractor. If the subcontractor needs more than one review copy returned, the subcontractor shall submit the number of copies shown in Table 01300–1 plus any extra copies required by the subcontractor.

C. If a submittal is not listed in Table 01300–1, but is listed in an individual section, the subcontractor is not relieved from the submittal requirement. The submittal shall be considered for review, unless otherwise directed by the Contractor.

Part 4—Measurement and Payment

4.1 Measurement

No separate measurement shall be made for work required in this section.

4.2 Payment

No separate payment will be made for work required in this section.

Table 01300–1. Project Submittal List

Submittal No.	T&C Article or Section No.	Submittal Type	Submittal Requirement	No. of Copies	Submittal Due*	Reviewer
1.	9	Review	No. 1-A. Certificate of Insurance and Workman's Compensation Insurance	1	with proposal	Contract Administrator
2.	20	Information	OSHA 300 Log; for calendar years: 2003, 2004, 2005	2	with proposal	Contract Administrator
3.	20	Information	OSHA 300A Log; for calendar years: 2003, 2004, 2005	2	with proposal	Contract Administrator
4.	20	Information	Experience Modification Rate (EMR); for calendar years: 2003, 2004, 2005	2	with proposal	Contract Administrator
5.	10	Review	No. 3-A. Performance & Payment Bonds	2	10 days after N.O.A.	Contract Administrator
6.	21	Information	No. 4-A. List of Lower Tier Subcontractors	1	with proposal	Contract Administrator
7.	20	Information	No. 5-A. List of Employees & « Competent Persons » Per OSHA	1	with proposal	Contract Administrator
8.	89	Information	Workplace Substance Abuse Program	1	10 days after N.O.A.	Contract Administrator

Submittal No.	Specification Reference	Submittal Type	Submittal Requirement	No. of Copies	Submittal Due*	Reviewer
	Division 1:					
9.	Section 01020 1.3F	Information	Employee training certificates	2	At site mobilization	Constr. Mgr.
10.	Section 01020 1.3G	Information	MSDS Sheets	2	Prior to introduction to the site	Constr. Mgr.
11.	Section 01020 1.3H	Review	Refueling plan	3	At site mobilization	Constr. Mgr.
12.	Section 01020 1.3I	Review	Hoisting & Rigging information	3	5 days prior to lift	Constr. Mgr.
13.	Section 01020 1.3J	Review	Competent Person Designation form	2	At site mobilization	Constr. Mgr.
14.	Section 01020 1.3K	Review	Qualified Operators/Laborers	2	At site mobilization	Constr. Mgr.

* - Submittals dates based on "scheduled" work shall be based on the subcontractor's project schedule and shall allow adequate time for Contractor review and resubmittal, if necessary, without causing project schedule delays.

Table 01300–1 (continued). Project Submittal List

Submittal No.	Specification Reference	Submittal Type	Submittal Requirement	No. of Copies	Submittal Due*	Reviewer
	Division 1:					
15.	Section 01025 1.4D	Information	Payment request and supplemental information	3	Monthly	Constr. Mgr.
16.	Section 01025 1.4E	Information	Daily summary weigh sheets	1	Daily	Constr. Mgr.
17.	Section 01050 1.3D	Review	Survey and quantity documentation for unit-priced work	3	Prior to payment request	Constr. Mgr.
18.	Section 01050 1.3F	Review	Surveyor resumes	3	7 days prior to commencing surveying	Contract Administrator
19.	Section 01060 1.3D	Information	Completed permits and approval applications	2	5 days prior to commencing applicable work and immediately upon receipt	Constr. Mgr.
20.	Section 01100 1.3D	Information	Schedule Revisions	2	Prior to implementation	Constr. Mgr.
21.	Section 01100 1.3E	Review	Initial project schedule	3	With proposal	Constr. Mgr.
22.	Section 01100 1.3F	Information	Recovery schedule	2	Monthly, when required	Constr. Mgr.
23.	Section 01100 1.3G	Information	Project equipment list	2	2 days prior to utilizing equipment	Constr. Mgr.
24.	Section 01100 1.3H	Review	Project record documents	3	Prior to final payment	Constr. Mgr.
25.	Section 01500 1.3D	Information	Staging area	2	Pre-construction conference	Constr. Mgr.
26.	Section 01500 1.3E	Information	Haul route	2	Pre-construction conference	Constr. Mgr.
	Division 2:					
27.	Section 02200 1.3D	Review	Backfill Materials	2	Pre-construction conference	Constr. Mgr.
28.	Section 02200 1.3E	Review	Water source	2	At site mobilization	Constr. Mgr.
29.	Section 02271 1.3D	Review	Non-woven geotextile	2	Pre-construction conference	Constr. Mgr.
30.	Section 02271 1.3D	Review	Turf Reinforcement Matting	2	Pre-construction conference	Constr. Mgr.
31.	Section 02900 1.3A	Review	Seed and Fertilizer		Pre-construction conference	Constr. Mgr.
32.	Section 02900 1.3B	Review	Erosion Blankets	2	Pre-construction conference	Constr. Mgr.

* - Submittals dates based on "scheduled" work shall be based on the subcontractor's project schedule and shall allow adequate time for Contractor review and resubmittal, if necessary, without causing project schedule delays.

Table 01300–1. Project Submittal List

Date

John Doe Contractors
Company Name
Address

Project Manager
S.M. Stoller
Address

Attn: John Doe, Project Manager

Subject: Submittals for Contract # _____ Project name

Gentlemen:

In accordance with the project contract documents we submit the following items:

Submittal Number	Submittal Name	Submittal Class	# of Copies Submitted	Reference Section No.	Estimated Due Date

Submittal # _____ deviates from the Subcontract requirements and a written explanation is attached to the submittal.

Submittal # _____ has been revised in accordance with the comments from S.M. Stoller dated _____. The original submittal number was _____.

If you have any questions please contact _____ at _____.

Sincerely,

Jane Doe, Subcontractor

Figure 01300–1. Sample Letter

End of Section 01300

Section 01500: Construction Facilities and Temporary Controls

Part 1—General

1.1 Scope

This section covers the installation, maintenance, and operation of all temporary facilities and controls necessary to support subcontractor and Contractor operations during the course of this subcontract. These temporary facilities and controls shall be removed at subcontract completion and include, but are not limited to, office trailers, drainage facilities, staging areas, access controls, lighting, and utilities.

1.2 Related Work

A. Section 01020—Construction Health and Safety

B. Section 01050—Field Engineering

C. Section 01300—Submittals

D. Section 02200—Earthwork: Excavation, Backfill, and Disposal

1.3 Submittals

A. Submittals shall be made in accordance with Section 01300 (Submittals).

B. Submittals shall be made for proposed substitutions.

C. Submittals shall be made as required on the Project Submittal List.

1.4 Specifications, Codes, and Standards

The publications listed below form a part of this section to the extent referenced. The publications are referred to in the text by the basic designation only.

Code of Federal Regulations

29 CFR 1910	Occupational Safety and Health Standards and for General Industry and standards incorporated by reference

1.5 Supporting Facilities

A. Subcontractor Facilities—General

The subcontractor shall consider the limited space available at the Project Site and schedule material deliveries, equipment use to minimize storage requirements.

B. Staging Area and Haul Routes

During the Project mobilization phase, the subcontractor shall develop and establish a Project staging area. Location and size shall be determined jointly by the subcontractor and Contractor. The staging area shall be used for vehicle parking and to place subcontractor facilities, material, laydown yard equipment, storage, and any other temporary items associated with the Project.

1. The staging area shall be located near the Project main access for the duration of the Project.

2. At Project completion, demobilize the staging area, and reclaim to preexisting conditions.

3. Submit to the Contractor for acceptance the location, size, and layout of the staging area.

4. Submit proposed haul routes for backfill materials, and material to be disposed.

5. Haul traffic shall comply with all applicable traffic control requirements.

C. Delivery and Storage Areas

1. When a Project staging area is required, material storage shall be provided. Projects not requiring a Project staging area shall still comply with the requirements of this Article.

2. The subcontractor shall schedule deliveries and unloading to prevent congestion, blocking of access to the Project Site, or interference with the work.

3. The subcontractor shall provide for continuity of supply and shall avoid change of supplier or manufacturer or change in brands of material during work whenever possible.

1.6 Temporary Utilities

A. Water and Sewer

1. The subcontractor shall provide all potable water to be used for drinking water by the subcontractor's workers.

2. The subcontractor shall provide an adequate number of chemical toilets for worker use at the work location per state and/or local standards. Toilets shall be serviced weekly.

3. The subcontractor shall provide an adequate number of hand-wash stations, at each toilet location, which shall be serviced weekly.

B. Telephone/Radio Service

The subcontractor shall use subcontractor provided cell phones for emergency use and communications. Communications must be maintained for emergencies between subcontractor field personnel working at all points on the project and supervisory personnel.

C. Electric Service

If the subcontractor elects to use generators to supply temporary electrical power for facilities, the generators shall be of adequate power to operate the facilities and equipment specified in this section. The generators shall be quiet and not produce noise levels above 85dBA as defined in 29 CFR 1910.95 Appendix A.

1.7 Weather Protection

A. The subcontractor shall provide for weather protection as required by site conditions.

B. The subcontractor shall furnish and install temporary enclosures as needed to protect construction work and materials from damage due to weather or elements, or to maintain suitable temperature during the installation or finishing of work. At all times, the subcontractor shall provide protection against freezing, storms, wind, rain, or heat to maintain work, materials, and equipment free from damage. At the end of each day's work, all work susceptible to damage shall be protected.

1.8 Trash and Debris Control

The subcontractor shall provide and maintain trash receptacles at all times during the execution of this subcontract. The subcontractor shall inspect the work site daily and remove trash/debris that has accumulated daily and properly dispose of it in a subcontractor-provided receptacle.

1.9 Delivery and Storage of Construction Materials

A. The subcontractor shall schedule deliveries and unloading to the staging area in a manner that will prevent congestion, blocking of access to the Project Site, or interference with the work in progress by both the Contractor and subcontractor.

B. The subcontractor shall provide for continuity of supply and shall avoid any change of supplier or manufacturer or change in brands of material during work.

C. The subcontractor shall deliver packaged materials to the Site in the manufacturer's original, unopened, labeled containers. Containers shall not be opened until the approximate time of use or as agreed to by the Contractor for the purposes of inspecting and testing.

1.10 Temporary Facilities Maintenance and Removal

A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the project.

B. Remove temporary facilities and controls as soon as the progress of the project permits or as directed by the Contractor.

C. All installed facilities shall be maintained in a clean, safe, and sanitary condition at all times until completion of the subcontract.

1.11 Dust Control

A. Visible dust shall not be allowed. The subcontractor shall take measures to control dust within the construction boundaries shown on the drawings. Dust suppression shall include all roadways, soil stockpiles, and other areas disturbed by the subcontractor. Subcontractor shall acquire water from the site Raw Water Pond, located at the west end of the site or other approved source.

B. The subcontractor shall take necessary measures to suppress visible dust. The subcontractor may use techniques that include, but are not limited to, the following:

1. Minimizing exposed earth work areas.

2. Enforcing lower speed limits (15 mph maximum) on all vehicles traveling within the Site.

3. Suppressing dust by spraying the area with water or a Contractor-accepted dust retardant, such as calcium chloride.

4. Maintaining adequate moisture content at all times in areas where the pre-existing surfaces have been removed or disturbed, and in materials that have been stockpiled on the job site so that dust shall not be generated.

1.12 Site Water Management

The subcontractor shall control and manage storm water runoff, water used for dust control, and water from cleaning activities..

1.13 Storm Water Pollution Prevention and Erosion-Control Measures

The subcontractor shall follow the requirements of the *Storm Water Pollution Prevention Plan* for the Project Site. Subcontractor shall prevent offsite movement of sediment from soil stockpiles and other sediment sources during normal storm events. Erosion control measures shall include use of temporary sediment ponds, temporary swales, ditches, diversion dikes, berms, straw bales, and silt fences, as required.

1.14 Mobilization/Demobilization

A. The subcontractor shall furnish, install, and construct facilities and mobilize all construction equipment, materials, supplies, and incidentals so they are ready to commence and perform the work.

B. The subcontractor shall assemble and deliver to the Project Site any equipment, materials, and supplies necessary for the performance of the work, but which are not intended to be incorporated in the work; provide for preparation of the subcontractor's work area; complete assembly, in safe working order, of equipment necessary to perform the required work; provide for personnel services required prior to commencing actual work; and provide all other preparatory work required to permit commencement of the actual work.

C. The subcontractor shall demobilize from the Site all construction equipment, materials, supplies, and appurtenances upon completion of the work.

D. The subcontractor shall maintain, operate, and subsequently remove and dispose of construction facilities as required by the Contractor, clean the Site, and regrade as necessary to restore to preconstruction grades indicated by existing contours on the drawings. At completion of this subcontract, all remaining temporary facilities and utilities installed under this subcontract shall be dismantled, demolished, removed, or otherwise disposed as appropriate and removed from the Project Site. Any buried temporary utilities shall be removed and not abandoned in place. At project completion, demobilize the subcontractor's staging areas. Regrade areas to match existing contours and promote drainage without erosion.

1.15 General Equipment Requirements

Fuel, fluids, lubricants, maintenance, parts, and repairs required for the safe, efficient operation of the specified equipment complying with manufacturer specifications shall be provided by the subcontractor. Inoperable equipment shall be repaired or replaced within one workday. Any production workdays lost due to inoperable equipment shall be applied to the end of the schedule for the specific activity at no cost to the Contractor. The fuel truck operator is bound by all the requirements of this subcontract and will require a Contractor safety briefing the first time equipment requires fueling.

All equipment shall be delivered clean and free of oil, fuel, and fluid leaks, and shall be maintained in a manner to avoid any leaks. If the subcontractor spills any hydrocarbon-based fluid, antifreeze, or other material, the subcontractor shall immediately notify the Contractor representative and follow directions to clean up the spill at the subcontractor's expense. If a piece of equipment is leaking, the equipment shall be "red-tagged" (taken out of service), diapered to prevent ground surface contamination, and repairs made at the subcontractor's expense.

Each piece of equipment shall be inspected by Contractor personnel upon mobilization to the Site for obvious defects and for Occupational Safety and Health Administration compliance (to include the fuel truck).

Part 2—Products

(Not Used)

Part 3—Execution

(Not Used)

Part 4—Measurement and Payment

4.1 Measurement

(Not Used)

4.2 Payment

(Not Used)

End of Section 01500

Section 02200: Earthwork: Excavation, Backfill, and Disposal

Part 1—General

1.1 Scope

This section describes the requirements, excavating, backfilling, compacting, and final grading. Earthwork materials include:

A. Common borrow

B. Drain rock for drainage areas and drain trough

C. Large rock

1.2 Related Work

A. Division 1 of these specifications

B. Section 01050—Field Engineering

1.3 Submittals

A. Submittals shall be made in accordance with Section 01300 (Submittals).

B. Submittals shall be made for proposed substitutions.

C. Submittals shall be made as required on the Project Submittal List, Table 01300–1.

D. Imported Backfill Materials

The subcontractor shall submit to the Contractor material sources and analyses for all imported backfill materials before delivery of the material to the Site. Analyses for all imported backfill materials shall indicate compliance with these specifications.

E. Submit water source per Article 3.3E of this section.

1.4 Specifications, Codes, and Standards

The publications listed below form a part of this section to the extent referenced. The publications are referred to in the text by the basic designations only.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO T 11	Materials Finer than .075-mm (No. 200) Sieve in Mineral Aggregates by Washing
AASHTO T 19	Bulk Density ("Unit Weight") and Voids in Aggregate
AASHTO T 27	Sieve Analysis of Fine and Course Aggregates
AASHTO T 89	Determining the Liquid Limit of Soils
AASHTO T 90	Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils

American Society for Testing and Materials (ASTM)

ASTM C 127	Standard Test Method for Specific Gravity and Adsorption of Coarse Aggregate
ASTM D 2487	Standard Test Methods for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM E 329	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.5 Earthwork Definitions

A. Excavation: Excavation is defined as material removal to reach the lines, grades, and depths shown on the drawings or determined by the Contractor.

B. Salvaged Excavation Materials: Salvaged excavation materials include on-site soil or rock materials from designated areas of the job site that are suitable as common borrow, fine aggregate or sand, or structural borrow in accordance with Article 2.1B of this section that are not otherwise classified as unsatisfactory fill material in accordance with Article 1.5E of this section.

C. Native Materials: Native materials are salvaged excavation materials that include on-site soils from the job site that are suitable as common borrow, aggregate or sand, or backfill in accordance with specified requirements of this section that are not otherwise classified as unsatisfactory fill material. Acceptable native materials shall not have rocks greater than 6 inches in diameter.

D. Overexcavation: Overexcavation is defined as excavation of any type of material in excess of the lines, grades, or depths indicated on the drawings.

E. Unsatisfactory Fill Materials: Unsatisfactory materials for fills or backfills include, but are not limited to: 1) those materials containing roots and other organic matter, trash, debris, frozen materials; and 2) materials that do not meet the specifications of this section. Materials that are unsuitable due to excessive moisture or incorrect gradation shall be reclaimed by screening, manipulation, aerating, or blending with other suitable materials. Should native material not be considered satisfactory, it will be considered a differing Site condition and handled under that clause of the *Terms and Conditions for Construction Subcontracts*.

F. Hard Material: Weathered rock, cemented deposits, or conglomeratic materials not defined as "Rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal. Hard material is characterized by the ability to be loosened or broken down by ripping in a single pass with a current-model, tractor-mounted, hydraulic ripper equipped with one digging point of standard manufacturer's design, adequately sized for use with, and propelled by, a crawler-type tractor rated at 500 net flywheel horsepower (minimum), operating in low gear.

G. Rock: Solid, homogeneous, interlocking, crystalline material, with firmly cemented, laminated or foliated masses, or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and using expansion jacks or feather wedges, or using backhoe-mounted, pneumatic hole-punchers or rock-breakers. "Hard Material" will not be considered rock because of intermittent drilling and blasting that is performed merely to increase production. Boulders of any size in non-bedrock formations will not be considered rock.

H. Stockpile Construction: Stockpile construction is defined as construction of a stable fill that will serve as a temporary storage stockpile.

I. Subgrade Preparation: Subgrade preparation includes scarifying, grading, and compacting existing ground upon which additional materials other than topsoil will be placed.

J. Frozen Soil: Frozen soil is soil that contains visible ice crystals, breaks angularly by hand, and is not pliable when squeezed.

1.6 Sequencing and Scheduling

The Subcontractor shall obtain the following clearances from the Contractor at the indicated hold points before proceeding.

A. Field Measurements—before commencing work, locate all baselines required for control of the work and establish required grade staking for control of excavation and embankment construction.

B. Authorization for overexcavation; before beginning overexcavation.

C. Investigation of rock or suspected rock encountered in excavation; before continuing with excavation.

D. Approval of prepared subgrades, including keying and benching; before placing fill on the subgrade surface.

E. Approval of filled surface; before covering the surface with the next soil lift, a different fill type, or other material that buries or conceals the surface. The Contractor shall review compaction test results and as-built grade information.

Part 2—Products

2.1 Backfill Materials

A. General

Do not use unsatisfactory fill material for any backfill.

B. Compacted Backfill: Use a locally available, approved material, no rocks larger than 1 ½-inch in diameter, and no frozen or deleterious materials. Contractor has selected a backfill obtained from the nearby Hall-Irwin aggregate pit.

C. Drain Rock: Use a poorly-sorted clean gravel, having a maximum particle size of 1-½-inches and not more than five percent, by weight, of the material passing the No. 40 sieve.

D. Large Rock: Use on-site rock greater than 24-inches in diameter. Contractor shall approve the material prior to placement.

Part 3—Execution

3.1 General

A. Prior to beginning excavation or demolition work in an area, the subcontractor shall construct temporary site drainage facilities as needed to control surface runoff and initiate dust control measures as required in Section 01500 (Construction Facilities and Temporary Controls) of these specifications.

B. Excavate to the contours, elevations, and dimensions indicated on the drawings.

C. Reuse excavated materials that meet the specified requirements for fill materials to be used in the work.

D. Keep excavations free from water. Management of ground water and storm water encountered in excavations shall be the responsibility of the subcontractor. When

ground water is encountered, notify the Contractor and allow the Contractor access to gather ground water data as needed. Remove standing water in excavation and backfill areas by pumping or by any other Contractor-accepted method for removing standing water. Water may be discharged to surface provided positive drainage away from the excavation occurs.

E. Notify Contractor at once of springs, seeps, or wet zones found in excavations.

F. Excavations and excavated materials shall follow current Occupational Safety and Health Administration (OSHA) requirements. Shoring, overexcavation, or other work may be required to comply with OSHA safety and health requirements. Cost for complying with OSHA requirements shall be incidental to the subcontractor's work.

G. Excavation activities shall comply with dust control requirements specified in Section 01500 (Construction Facilities and Temporary Controls).

H. Storage and Disposal

1. Dispose of unsatisfactory materials from excavations in Contractor-designated waste areas.

2. Construct and operate surplus-material storage areas and waste areas as stockpiles.

3. Do not store or dispose of excavated material in a manner that obstructs the flow of any stream, ditch, or drainage way, except in the case of sediment control areas; endangers partly finished work; or impairs the efficiency or appearance of a structure or facility or is detrimental to the completed work.

4. Excess materials remaining in stockpiles after completion of all required fills shall be removed.

I. Excavation Near Existing Utility Lines

1. Notify Contractor in writing 5 days prior to excavating over a utility line. Proceed only with written notice from Contractor.

2. The subcontractor assumes responsibility for the safe performance of the excavation and for ensuring subtier contract performance. The subcontractor shall locate all known utility lines; perform "blind searches" for unknown utility lines; mark and stake out the utility line route locations; de-energize utility lines (when applicable); perform lock-out and tag-out; excavate around or near utility lines; and place the utility line or system back into operation.

3. All utility locates will be recorded on the Site Supervisor's and the subcontractor's field/working drawings.

a. No exploratory excavation shall be done on buried electrical utilities until the electrical lines have been de-energized. No excavation of any kind shall be performed around energized electrical lines without the written concurrence of the Contractor. A Job Safety Analysis may include a Safe Work Permit and use of personal protective equipment and will be completed prior to written notice from the Contractor. A lockout/tagout procedure shall be required.

b. Exploratory holes ("pot holes") shall be dug on 10-foot (ft) maximum centers and directly over the intersection.

c. If the exploratory holes have confirmed that the utility is 18 inches or less in depth, all excavation above or below the line, and 18 inches lateral to the line, shall be removed by hand excavation.

d. If the exploratory holes have confirmed that the utility is more than 18 inches in depth, machine excavation will be allowed to within 18 inches vertically of the line. If additional excavation is required, it shall be removed by hand excavation and the hand excavation shall include the area 18 inches on each side of the line. Therefore, the hand excavation zone is 18 inches above, 18 inches lateral to and below the utility.

e. While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard employees.

f. Employees shall not work in such proximity to any part of an electric power circuit that they could contact the electric power circuit in the course of work, unless the employees are protected against electric shock by de-energizing the circuit and grounding it or by guarding it effectively by insulation or other means.

4. Work beneath energized overhead electrical lines shall maintain the following required safe working distance:

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated to maintain a clearance of at least 10 ft, plus 4 inches for every 10 kilovolts over 50 kilovolts. This clearance may be reduced under the following conditions:

a. If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. However, if the voltage is greater than 50 kilovolts, the clearance must be increased 4 inches for every 10 kilovolts over that voltage.

b. If insulating barriers are installed to prevent contact with lines, if the barriers are rated for the voltage of the line being guarded, and if the barriers are not part of or an attachment to the vehicle or its raised

structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

3.2 Watering for Moisture Control

A. On-site water source will be the Raw Water Pond located at the west end of the site as indicated on the drawings.

B. Watering for moisture control during compaction shall consist of furnishing equipment, accessories, and incidentals necessary to apply water. The subcontractor shall make arrangements for moisture control per Section 01500 (Construction Facilities and Temporary Controls).

C. Water for compacting common borrow material, subbase, base, and surfacing material shall be applied by means that ensures a uniform application.

D. All equipment used for the application of water shall be equipped with a positive means of shut off.

E. Water shall be free of oils, acids, alkalies, salts, or any substance injurious to human, animal, or plant life. Imported water sources are considered as a proposed material substitution and shall be reviewed for acceptance by the Contractor prior to use on the project.

3.3 Placing Compacted Backfill

F. Fill materials shall be placed and compacted to the lines and grades shown by the final contour lines and grade-control points shown on the drawings and blended to match preexisting undisturbed surfaces.

G. Do not place fill in standing water or on snow, ice, muddy, or frozen subgrades.

H. Do not damage existing TRM to remain in place with construction equipment. Placement of fill on TRM within the channel is acceptable. TRM shall be modified as necessary to prevent the creation of annular spaces within the compacted backfill.

I. Maintain a uniform moisture distribution in each fill lift until it is compacted.

J. Rework or remove and replace fill that fails to comply with specification or drawing requirements, at no extra cost to the Contractor.

K. Performance specification procedure for compaction to determine the minimum number of passes of the compaction equipment:

1. Construct a test pad to determine the number of passes required to achieve the greatest degree of compaction with the equipment intended for use. (In most

cases, the test pad may be the first lift compacted in the specific construction area being raised.)

2. Spread a representative layer of soil material in a loose lift not to exceed 12-inches depth.

3. Survey (using a level instrument) and record the surface elevations of the test pad in a tabular format. Choose enough point locations to develop a profile with at least 10 equally spaced stations, not exceeding 100-foot intervals. Record elevations at each station.

4. Begin compaction with one-pass of compaction equipment.

5. Repeat step 3 above.

6. Compute the elevation difference at each station.

7. Repeat steps 4 through 6 until the difference in successive readings is less than 0.1 feet.

8. Define the required number of passes to achieve maximum compaction as that number required when all stations meet the criterion of step 6.

3.4 Placing Drain Rock for Drainage Areas and Drain Trough

A. Remove existing TRM as necessary to install drainage layer in areas as directed in the field.

B. Prepare subgrade as necessary to obtain a smooth channel side slope to remove existing slump areas. For drain trough, excavate a trench to the dimensions shown on the Drawings.

C. No material shall be placed until the subgrade has been checked and approved by the Contractor. Non-woven goetextile material shall be placed only on prepared, relatively smooth subgrade surfaces.

D. Drain rock shall be placed to the dimensions and areas shown on the Drawings.

E. The inclusion of earth, sand, or rock dust in excess of 5 percent by volume of the finished riprap layer shall not be permitted.

F. Care shall be taken during placement not to damage the earth slopes, or the geotextile on which the riprap is placed.

G. Overlap edges of non-woven geotextile a minimum of two feet or sew seams together with approved method to completely wrap the drain rock. For drain trough, trim non-woven geotextile as necessary or as directed in the field.

3.5 Access Ramp

H. Construct access ramp down to the west perimeter channel to the contours, elevations, and dimensions indicated on the drawings.

I. Place excavated material for access ramp construction in the upper portions of the west perimeter channel as directed by the Contractor.

J. Remove existing tumbleweeds and other vegetation prior to fill placement. Backfill may be placed over the existing turf reinforcement matting (TRM). Subcontractor should be aware of the existence of TRM pins which could potentially puncture equipment tires.

Part 4—Measurement and Payment

4.1 Measurement

A. Measurement will be determined by the units included in the BOA contract.

4.2 Payment

B. Payment will be determined by the unit rates included in the BOA contract.

End of Section 02200

Section 02271: Geosynthetics

Part 1—General

1.1 Scope

This section describes the requirements for installing geosynthetic materials for the drainage areas, drain trough and erosion control material for the west perimeter channel.

1.2 Related Work

A. Section 01050—Field Engineering

B. Section 01300—Submittals

C. Section 02200—Earthwork: Excavation, Backfill, and Disposal

1.3 Submittals

A. Submittals shall be made in accordance with Section 01300 (Submittals).

B. Submittals shall be made for proposed materials substitutions.

C. Submittals shall be made as required on the Project Submittal List, Table 01300–1.

D. Product Data

1. Manufacturer's certifications that all geosynthetic products comply with specification requirements.

2. Manufacturer's quality control test data for all geosynthetic products.

3. Manufacturer's instructions for handling, storing, installing, seaming, and repairing all geosynthetics.

E. Samples

Geotextiles: Minimum 12 inches by 36 inches.

1.4 Specifications, Codes and Standards

The publications listed below form a part of this section to the extent referenced. The publications are referred to in the text by the basic designations only.

American Society for Testing and Materials (ASTM)

ASTM D 1603 Standard Test Method for Carbon Black in Olefin Plastics

ASTM D 3776	Test Methods for Mass per Unit Area (weight) of Woven Fabric
ASTM D 4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D 4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D 4833	Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4873	Identification, Storage, and Handling of Geotextiles
ASTM D 5596	Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
ASTM D 6566	Test Method for Measuring Mass Per Unit Area of Turf Reinforcement Mats

1.5 Quality Assurance

F. Source Quality Control

Provide manufacturer's quality control test data for geotextile lots to be installed. Include the following:

4. Supplier's name, production plant, brand name, and lot number of resin used to manufacture geotextile.

5. Copies of dated quality control certificates from resin supplier.

6. Manufacturer's test data verifying that resin meets manufacturer's specification.

7. Statement that reclaimed polymer was added to resin with appropriate cleanliness.

8. Percent (by weight) of geotextile components, including base polymer, carbon black (if specified), and other additives.

9. Manufacturer's test results verifying compliance with specification requirements for geotextile.

10. Manufacturer's specification for geotextile, including all properties published by manufacturer, measured using appropriate test methods.

11. Written guarantee that geotextile conforms to manufacturer's specification.

12. Manufacturer's installation requirements.

1.6 Delivery, Storage, and Handling

A. Packaging, Shipping, and Unloading

1. Deliver products in accordance with Terms and Conditions for Construction Subcontracts (T&Cs).

2. Package and ship rolls of materials so they are not damaged during shipment. Mark each roll with an indelible label bearing the material type, thickness, length, and width, batch and roll numbers, manufacturer's name and plant location, and date of manufacture.

3. Upon delivery, check shipping ticket and roll labels to confirm that the type, lot number, thickness, physical properties, and dimensions are as in the manufacturer's product data submittals. If differences exist, do not use the products unless approved by Contractor.

4. Unload and store geosynthetic products only when Contractor is present to observe.

5. Separate damaged from undamaged rolls when unloading. Contractor is the final authority as to whether a roll is damaged. Replace damaged rolls at no cost to the Contractor.

B. Acceptance: Contractor may inspect, sample, and independently test geosynthetic products for acceptance.

C. Storage, Handling, and Protection

1. Store and protect products in accordance with T&Cs.

2. Handle products at all times to prevent damage to the materials or the work.

3. Store and handle geotextiles in compliance with ASTM D 4873 and manufacturer's instructions.

1.7 Sequencing and Scheduling

Obtain the following clearances from the Contractor at the designated hold points.

A. Approval of GCL or geomembrane installer and personnel; before mobilizing installer and personnel to Site.

B. Approval of product data and shop drawings; before delivering products and fabricated items to Site.

C. Approval of each subgrade; before installing GCL/geomembrane on subgrade.

D. Approval of each installed geosynthetic product; before placing overlying geosynthetic products or covering with fill or other material.

Part 2—Products

2.1 Materials—General

A. Specified physical properties of geosynthetic products are minimum average roll values.

B. Minimize the number of seams and overlaps by providing the largest roll widths and lengths that are practical to handle at the Site.

2.2 Geotextile Materials

A. Geotextile for use in the drainage areas and drain trough shall be a non-woven polyester or polypropylene material having a weight of 6 ounces per square yard and a flow rate of at least 100 gallons per minute per square foot when tested in accordance with ASTM D4491. The non-woven geotextile shall be Mirafi® 160N or approved equivalent.

B. Geosynthetic for use as erosion control in the west perimeter channel shall be a composite turf reinforcement mat (TRM) machine- produced of 100 percent UV stabilized polypropylene fiber matrix incorporated into a a permanent three-dimensional matting with staple patterns clearly marked. The TRM shall be a North American Green P550 or approved equivalent.

C. Erosion control blankets are discussed in Section 02900 for revegetation activities.

Part 3—Execution

3.1 General Installation

A. Install geosynthetic products to the lines and grades indicated. Anchor geosynthetic products as indicated.

3.2 Subgrade Preparation

A. Subgrade shall be prepared in accordance with Section 02200 (Earthwork: Excavation, Backfill, and Disposal).

B. Do not install geosynthetic until written acceptance of the subgrade by the geosynthetic installer is provided to the Contractor and the Contractor provides written authorization to proceed to the subcontractor. Acceptance shall include verification that:

1. The lines and grades of the subgrade are as indicated on the drawings.

3.3 Installing Geotextile for Drainage Areas and Drain Trough

A. Surface Preparation

2. Soil and Fill Subgrades: Prepare a relatively smooth subgrade, free of obstructions, abrupt depressions or humps, debris, and deposits of soft or loose soil.

3. Geotextile Surfaces: Clean the geotextile surface of water, trash, roots, branches, stones and rocks, debris, and other foreign matter prior to placing aggregate.

B. Handling and Layout

1. Lay out geotextile smooth and free of wrinkles, but loose enough that placement of overlying materials will not stretch or tear the fabric.

2. Overlap geotextile sheets so that the uphill sheet overlies the downhill sheet a minimum 18 inches.

3. Temporarily secure geotextile to prevent unintended displacement by wind, water, or construction activities.

4. Repair or replace, at Contractor's option, geotextile that is torn or punctured. Repair by placing a geotextile patch over the damaged area, overlapping the existing geotextile by 12 inches (minimum) from any part of the damaged area. Repair or replace at no extra cost to Contractor.

3.4 TRM for Channel Erosion Control

A. Prepare soil before installing blankets, including any necessary application of lime, fertilizer, and seed.

B. Begin at the top of the slope by anchoring the blanket in a 6" (15cm) deep x 6" (15cm) wide trench with approximately 12" (30cm) of blanket extended beyond the up-slope portion of the trench. Anchor the blanket with a row of staples/stakes approximately 12" (30cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to compacted soil and fold remaining 12" (30cm) portion of blanket back over seed and compacted soil. Secure blanket over compacted soil with a row of staples/stakes spaced approximately 12" (30cm) apart across the width of the blanket.

C. Roll center blanket in direction of water flow on bottom of channel. Blankets will unroll with appropriate side against soil surface. All blankets must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide. When using the marking pattern, staples/stakes should be placed through each of the colored dots corresponding to the appropriate staple pattern.

D. Place blankets end over end (shingle style) with a 4"–6" (10cm–15cm) overlap. Use a double row of staples staggered 4" (10cm) apart and 4" (10cm) on center to secure blankets.

E. Full length edge of blankets at top of side slopes must be anchored with a row of staples/stakes approximately 12" (30cm) apart in a 6" (15cm) deep x 6" (15cm) wide trench. Backfill and compact the trench after stapling.

F. Adjacent blankets must be overlapped approximately 2"–5" (5cm–12.5cm) (depending on blanket type) and stapled.

G. The terminal end of the blankets must be anchored with a row of staples/stakes approximately 12" (30cm) apart in a 6" (15cm) deep x 6" (15cm) wide trench or tied into existing TRM. Backfill and compact the trench after stapling.

Part 4—Measurement and Payment

4.1 Measurement

A. Evaporation Pond Liner: No separate measurement for the evaporation pond liner shall be done.

B. No separate measurement shall be made for drainage trenches, geotextiles, or PVC geomembrane.

4.2 Payment

A. No separate payment for the evaporation pond liner shall be made: Payment for the evaporation pond liner system shall be included in the lump sum price for the evaporation pond and shall include installation of RPP geomembrane, sand ballast tubes and sand bags, anchor trenches, and testing. This price shall be full compensation for installation and construction of all components of the liner from the top of RPP through the bottom of the Type A Soil layer.

B. No separate payment will be made for drainage trenches, geotextiles, or PVC geomembrane. Payment will be included in the lump-sum price for installation of the drain trenches.

End of Section 02271

Section 02900: Revegetation

Part 1—General

1.1 Scope

This section addresses the establishment of vegetation on the project area. The objectives of the revegetation are to establish permanent, diverse plant communities that stabilize the soil, enhance wildlife habitat, and encourage biodiversity.

1.2 Related Work

A. Section 01300—Submittals

B. Section 02200—Earthwork: Excavation, Backfill, and Disposal

1.3 Submittals

A. Submit information on proposed seed and fertilizer supplier(s) at least 5 days prior to delivery.

B. Submit manufacturer's data on erosion blankets, at least 5 days prior to delivery.

1.4 Quality Control

A. Use adequately skilled workers, or qualified subcontractors, for the performance of all vegetation establishment activities.

B. Prior to vegetation establishment, Subcontractor shall verify that all surfaces are to final grade and that all soil preparation activities have been completed and accepted.

C. Contractor shall provide seed mixture in containers showing the percentage of each species in the seed mix, year of production, net weight, date of packaging, name and address of supplier, percent of weed seed content, and guaranteed percentage of purity and germination.

D. All products are to be delivered to the site with the product labels on the bags or intact (where applicable). Additionally copies of the delivery packing slip with the quantities delivered shown shall be provided to the Contractor. If the delivery packing slip does not specify the quantities delivered then a copy of the order receipt shall be provided to the Contractor that shows the quantities ordered/delivered.

1.5 Delivery, Storage, and Handling

A. Deliver grass see mixture in sealed containers. Seed in damaged packaging is not acceptable.

Part 2—Products

2.1 Seed Suppliers

A. Seed shall conform to the Colorado State Department of Agriculture Seed Act.

B. Seed shall be free of seed designated as noxious by the State of Colorado.

C. Seed used on the project shall have been collected from the closest available geographic source.

D. Seed labels shall clearly specify species, variety (when applicable), origin, date of harvest, lot number, name and address of seed company, and percentages of crop, purity, germination, inert material, non-noxious weed seed, and noxious weed seed. Laboratory seed testing results for purity and germination shall not be older than 18 months. Seed labels shall be on the bags, or intact, when seed is delivered to the site. The seed certifications shall be submitted to the Contractor for approval prior to purchasing the seed.

2.2 Seed Mixture

A. Seed mixtures are provided in Table 1 (Hillside Slope Area Seed Mix) and Table 2 (Flat Areas Seed Mix). The Hillside Slope Seed Mix will be used on all hillside locations, on the face of the OLF, and in the West Perimeter Channel. The Flat Areas Seed Mix will be used on the access road and other disturbed areas on the top of the hill North of the OLF. Seed rates are established on the basis of pure live seed (PLS), which varies between seed lots.

Table 1
Hillside Slope Areas Seed Mix
(Hillside Areas Or Areas with Slopes Greater than 10%)

Species	Common Name	Variety	PLS lbs/ac	PLS%
Graminoids				
Agropyron dasystachyum	Thickspike Wheatgrass	Critana	0.73	5
Agropyron smithii	Western Wheatgrass	Arriba	4.17	23
Agropyron trachycaulum	Slender Wheatgrass	San Luis	2.72	15
Bouteloua curtipendula	Side-Oats Grama	Vaughn	1.49	13
Bouteloua gracilis	Blue Grama	Hachita	0.74	24
Buchloe dactyloides	Buffalo Grass	Texoka	4.84	10
Stipa veridula	Greeen Needle Grass	Lodorm	1.21	10
	Total		**15.9**	**100**

Note:
1) This pounds per acre assumes drill-seeding is used. If the seed is to be broadcast, the application rates are to be doubled.
2) PLS = pure live seed. Be sure to specify this to the seed dealer when ordering.
3) The seed is to be certified weed free.

Table 2
Flat Areas Seed Mix

(Areas on Pediment Tops[4] with Slopes Less than 10%)

Species	Common Name	Variety	PLS lbs/ac	PLS%
Graminoids				
Agropyron smithii	Western Wheatgrass	Arriba	3.63	20
Agropyron trachycaulum	Slender Wheatgrass	San Luis	1.82	10
Andropogon gerardii	Big Bluestem	Bonilla	1.68	10
Andropogon scoparius	Little Bluestem	Aldous	0.77	8
Boutelous curtipendula	Side-Oats Grama	Vaughn	1.72	15
Bouteloua gracilis	Blue Grama	Hachita	0.46	15
Buchloe dactyloides	Buffalo Grass	Texoka	2.42	5
Kolena pyrimidata	June Grass		0.03	3
Sorghastrum nutans	Indian Grass	Cheyenne	0.36	2
Sporobolus cryptandra	Sand Dropseed		0.03	7
Stipa veridula	Green Needlegrass	Lodorm	0.95	5
	Total		**13.87**	**100**

Note:

1) This pounds per acre assumes drill-seeding is used. If the seed is to be broadcast, the application rates are to be doubled.
2) PLS = pure live seed. Be sure to specify this to the seed dealer when ordering.
3) The seed is to be certified weed free.
4) The pediment tops are the upper flat surface ares at the Site.

B. Changes from the seed mixtures must be approved by the Contractor.

2.3 Erosion Control Materials

A. The Erosion Control Plan for the Rocky Flats Property Central Operable Unit (ECP) shall be followed for all erosion controls. The subcontractor is responsible to follow and comply with all the requirements of the ECP and for daily monitoring of erosion controls through completion of the project. The BMPs for work in Preble's mouse habitat (found in the ECP) shall also be followed because part of the project is located in Preble's mouse habitat.

2.4 Straw Bales

A. Quality: Straw bales shall consist of clean (free of noxious weed seed) oat or wheat straw. The revegetation subcontractor shall submit documentation from the Colorado Department of Agriculture to show that the straw to be used on the project is produced from a certified weed-free field. Straw bales shall be trenched in place.

B. Quantity: The number of straw bales to be used for erosion control will be based on the number needed to meet the requirements of the Erosion Control Plan or as designated by the Contractor. The manufacturers recommendations for installation protocols and the number of stakes needed for installation shall be followed to ensure proper functioning of the erosion controls.

2.5 Wattles

A. Quality: Wattles shall consist of clean (free of noxious weed seed) rice or wheat straw. Nine inch diameter by 25 foot length wattles shall be used.

B. Quantity: The number of wattles to be used for erosion control will be based on the number needed to meet the requirements of the SWPPP or as designated by the Contractor for specific locations. The manufacturers recommendations for installation protocols and the number of stakes needed for installation shall be followed to ensure proper functioning of the erosion controls. Wattles shall be trenched in place.

2.6 Erosion Control Blankets

A. Quality: Two types of erosion control blankets will be used. In the West Perimeter Channel, the product North American Green VMAX 550 shall be used. At all other hillside locations, either Greenfix America CF072B or North American Green C125BN erosion control blankets shall be used. Product labels shall be on the bags, or intact, when it is delivered to the site.

B. Quantity: The number of erosion control blankets to be used will be based on the number needed to meet the requirements of the SWPPP or as designated by the Contractor for specific locations. The manufacturer's recommendations for installation protocols and the number of stakes needed for installation shall be followed to ensure proper functioning of the erosion controls.

2.7 Hydromulch

A. Quality: The hydromulch to be used as the final erosion control cover at specified locations is Flexterra. Product labels shall be on the bags, or intact, when it is delivered to the site.

B. Quantity: The Flexterra shall be applied at a rate of 3,200 pounds per acre. The manufacturer's instructions for the mixing and application of the Flexterra shall be followed.

Part 3—Execution

3.1 Revegetation

A. Install pre-construction erosion controls as shown on the Drawings. The subcontractor is responsible to follow the Erosion Control Plan for Rocky Flats Property Central Operable Unit (attached) and to adhere to the requirements contained within it.

B. Scarify the upper 8 inches of the final soil surface to allow for vegetation establishment. Also in order to attached the VMAX550 erosion matting properly, the final surface will have to be fairly smooth, so it cannot be left with giant dirt clods.

C. Seed shall be broadcast or drilled at the rates specified Tables 1 and 2. Figure – shows which seed mix is to be used at the different locations. All seeding equipment shall be pressure-washed prior to arriving on the project site to eliminate contamination by chemical fertilizers and/or undesirable plant species.

D. Broadcast Seeding

1. A mechanical broadcaster will be used for broadcast seeding. The seeder will be calibrated to distribute the seed at the prescribed rates. If the seed is too "trashy" to be accommodated in a broadcaster, the seed may be hand-

broadcast at the prescribed rates. However, hand-broadcasting must be pre-approved by the Contractor prior to implementation if it is to be used. The seed shall be evenly distributed across the area. Broadcasting shall not be performed when wind conditions exceed 12 miles per hour.

2. Seed shall be raked or harrowed into the soil immediately following broadcast seeding, covering the seed to a depth of 0.20 to 0.40 inch. A piece of chain or fence pulled behind the broadcast seeder will be acceptable for harrowing provided it is demonstrated that it does not cover the seed too deeply.

E. Drill Seeding

1. A seed drill may be used to apply the seed if broadcasting is not desirable. A rangeland type drill with double coulter furrow openers and depth bands followed by packer wheels should be used. The drill should be capable of evenly distributing the native seeds across each location.

2. Plant seed to an average depth of 0.25 inches, but no deeper than 0.40 inches.

3. Perform seeding in two directions perpendicular to each other (where feasible), each direction at half the specified rate. Calibrate the seed drill to the specified seeding rate in the presence of the Contractor.

F. Final erosion control materials shall be applied ASAP after seeding has been done as shown on the Drawings. Erosion control materials shall be applied to all of the locations after they have been seeded. Wattles and erosion blankets shall be installed prior to application of the Flexterra product so that the Flexterra product is not disturbed or damaged by wattle/erosion blanket installation activities.

G. The revegetation subcontractor shall remove all trash and debris at the completion of erosion control installation, seedbed preparation, seeding, and hydromulching activities.

Part 4—Measurement and Payment

4.1 Measurement

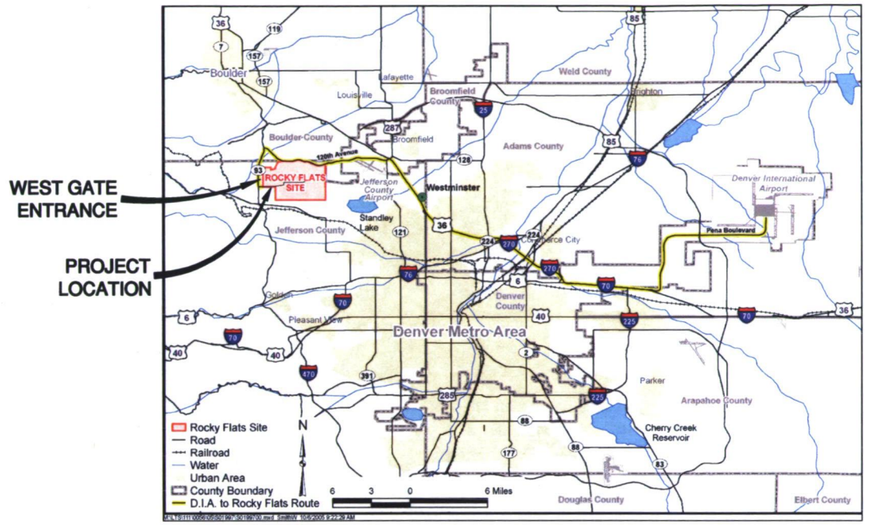
A. Measurement will be determined by the units included in the BOA contract.

4.2 Payment

A. Payment will be determined by the unit rates included in the BOA contract.

End of Section 02900

UNITED STATES
DEPARTMENT OF ENERGY
LEGACY MANAGEMENT
ROCKY FLATS SITE
WEST PERIMETER CHANNEL STABILIZATION



SITE LOCATION MAP

INDEX OF DRAWINGS

ABBREVIATIONS

APPROX.	APPROXIMATE	HORIZ.	HORIZONTAL	SHT	SHEET
℄	CENTER LINE	INV	INVERT	STA.	STATION
DOE	DEPARTMENT OF ENERGY	MAX.	MAXIMUM	THK.	THICK
E	EASTING	MIN.	MINIMUM	TRM	TURF REINFORCEMENT MAT
EL. OR ELEV.	ELEVATION	MW	MONITORING WELL	TYP	TYPICAL
EXIST.	EXISTING	N	NORTHING		
		NA	NOT APPLICABLE		
		NIC	NOT IN CONTRACT		
		NTS	NOT TO SCALE		
		ROW	RIGHT OF WAY		

DRAWING LEGEND

PLAN

- —T— —O— W— BURIED – TELEPHONE/OPTICAL/WATER
- —E— —G— IP— BURIED – ELECTRICAL/GAS LINES/ IRRIGATION PIPE
- RAILROAD TRACK
- WIRE FENCE
- CHAIN LINK FENCE
- SILT FENCE
- DRAINAGE DITCH/WATER LINE LIMITS
- EXISTING UNIMPROVED DIRT ROAD
- OVERHEAD ELECTRICAL LINE
- TREES/SHRUBS/BRUSH
- PROJECT ACCESS/HAUL ROUTE
- UTILITY POLE
- UNDERGROUND DRAINAGE CULVERT
- XXXX EXISTING MONITORING WELL
- 36 HIGHWAY
- SLOPE/FLOW ARROW
- TOP OF SLOPE
- SURVEY CONTROL POINT
- BUILDING/STRUCTURE

SECTION

- COMPACTED SOIL
- UNDISTURBED SOIL
- GRAVEL OR DRAIN ROCK
- REVEGETATION

DETAIL SYMBOL

1 — DETAIL NUMBER/SECTION LETTER
2 | 3 — SHEET ON WHICH DETAIL/SECTION IS TAKEN FROM / SHEET ON WHICH DETAIL/SECTION IS DRAWN

REVISION NO.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	PROJECT A/E	APPROVAL

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AC01-02SL79491

PROJECT LOCATION
ROCKY FLATS SITE
GOLDEN, COLORADO

REFERENCE

TETRA TECH

APPROVALS		
DRAWN BY	T. BOEHLER	10/24/08
CHECKED	J. KIENHOLZ	10/24/08
PROJECT ENGINEER	[illegible]	10/24/08
APPROVED BY	D. NORDEEN	10/24/08
PROJECT MGR.	L. KAISER	10/24/08
DOE CONCURRENCE	(SEE RECORD)	10/24/08

ORIGINAL LANDFILL
WEST PERIMETER CHANNEL STABILIZATION

TITLE SHEET

PROJECT NO. LTS-111-0056-07-001D
DRAWING NO. S04676-R00-T01-D+
SHT. 1 OF 6

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ACCESS ROAD

CONSTRUCTION ACCESS ROUTE. REVEGETATE FOLLOWING CONSTRUCTION ACTIVITIES

ORIGINAL LANDFILL

SUBCONTRACTOR STAGING AREA AND BACKFILL STOCKPILE LOCATION

LIMITS OF WASTE BOUNDARY

DIVERSION BERM 1

DIVERSION BERM 2

DIVERSION BERM 3

DIVERSION BERM 4

DIVERSION BERM 5

DIVERSION BERM 6

DIVERSION BERM 7

Tt-1

Tt-2

Tt-3

Tt-4

Tt-5

Tt-6

Tt-7

A

B

C

D

E

F

G

H

INSTALL 2 ROWS OF GEORIDGES AT ENDS OF DIVERSION BERMS 1 AND 2

EXISTING AREAS OF SATURATION

SATURATED AREA IN SPRING 2007 NEAR SEEP NO. 4

SATURATED AREA IN SPRING 2007 DUE TO SEEP NO. 7

APPROXIMATE BOUNDARY OF CONSTRUCTION ACTIVITIES

WEST PERIMETER CHANNEL

EAST PERIMETER CHANNEL

APPROX. SEEP #1 AREA

APPROX. AREA SATURATED NEAR SEEP #2 AND #3

APPROX. LOCATION OF SEEP #8

BUTTRESS

INSTALL 2 ROWS OF 20" WATTLES IN WEST CHANNEL

INSTALL 9-INCH DIAMETER WATTLES ALONG ENTIRE SOUTHERN EDGE. ALSO INSTALL T-POSTS AND ORANGE CONSTRUCTION FENCE ALONG WATTLES TO DELINEATE CONSTRUCTION BOUNDARY

RESTRICTION AREAS - PREBLE'S HABITAT (SEE NOTE 4)

WOMAN CREEK

6045 6040 6035 6030 6025 6020 6015 6010 6005 6000 5995 5990 5985 5980 5975 5970 5965 5960 5955 5950 5945

LEGEND:

- DITCH/CHANNEL/CREEK
- ROAD
- Tt-1● INCLINOMETER LOCATION
- RESTRICTION AREAS - PREBLE'S HABITAT
- —G— GASLINE ROW
- C● SETTLEMENT MONUMENT
- EROSION CONTROL WATTLES (9")
- EROSION CONTROL WATTLES (20")

M:\LTS\111\0056\EP\0010\504677\504677R00.DWG 10/27/08 3:48pm whitney

NOTES:

1) CONSTRUCTION ACTIVITIES IN THIS CONTRACT WILL BE LIMITED TO THE WEST PERIMETER CHANNEL AND SHADED AREAS SHOWN ON THE PLAN.
2) SURFACE CONTOURS BASED ON TOPOGRAPHIC SURVEY BY FLATIRONS, INC. IN JULY 2008.
3) DO NOT DISTURB INCLINOMETERS AND SETTLEMENT MONUMENTS.
4) DO NOT CONDUCT CONSTRUCTION ACTIVITIES SOUTH OF PREBLE'S HABITAT BOUNDARY LINE.

N

PROJECT SITE PLAN

SCALE IN FEET
60 30 0 60 120 180

CONTOUR INTERVAL (WITHIN OLF) = ONE FOOT
CONTOUR INTERVAL (OUTSIDE OLF) = TWO FEET

REVISION NO.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	PROJECT ACT	APPROVAL

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by S.M. Stoller Corporation
Under DOE Contract No. DE-AC01-02GJ79491

PROJECT LOCATION: ORIGINAL LANDFILL, ROCKY FLATS SITE, GOLDEN, COLORADO

REFERENCE: TETRA TECH

APPROVALS		
DRAWN BY	T. BOEHLER	10/24/08
DESIGNED BY	J. KIENHOLZ	10/24/08
PROJECT MGR	J. TUSHAUSEN	10/24/08
APPROVED BY	D. NORDEEN	10/24/08
PROJECT DIVISION	L. KAISER	10/24/08
DOE CONCURRENCE	(SEE RECORD)	10/24/08

ORIGINAL LANDFILL
WEST PERIMETER CHANNEL STABILIZATION

PROJECT SITE PLAN

PROJECT NO. LTS-111-0056-07-001D
DRAWING NO. 504677-R00-F01-D+
SHT. 2 OF 6

TOE OF REGRADED SLOPE TABLE 1

POINT ID	NORTHING	EASTING	ELEVATION
A	747690.44	2080885.66	6020.00
B	747665.46	2080916.02	6015.00
C	747656.62	2080961.46	6010.00
D	747652.37	2081006.60	6005.00
E	747656.90	2081059.91	6000.00
F	747637.35	2081108.29	5995.00
G	747615.74	2081148.82	5990.00
H	747585.05	2081184.54	5985.00
I	747550.66	2081212.83	5980.00
J	747525.77	2081232.77	5975.00
K	747502.99	2081242.03	5970.00
L	747486.60	2081258.45	5965.00

SUBCONTRACTOR STAGING AREA AND BACKFILL STOCKPILE LOCATION

CONSTRUCT ACCESS RAMP. PLACE CUT FROM EXCAVATION IN UPPER FILL PORTION OF THE WEST PERIMETER CHANNEL

DIVERSION BERM 1

AREA OF WEST PERIMETER CHANNEL SLOPE STABILIZATION CONSTRUCTION

SIDE SLOPE DRAINAGE AREA A (SEE NOTE 5 AND DETAIL 5)

DIVERSION BERM 2

LIMITS OF WASTE

FILL AROUND EXISTING LARGE ROCKS IN CHANNEL BOTTOM. INSTALL NEW LARGE ROCKS AS DIRECTED

CONSTRUCT 2 FT. X 2 FT. DRAIN WITH 1 1/2" DRAIN ROCK WRAPPED IN NON-WOVEN GEOTEXTILE. (SEE DETAIL 6)

SIDE SLOPE DRAINAGE AREA B (SEE NOTE 5 AND DETAIL 5)

FILL AROUND EXISTING LARGE ROCKS IN CHANNEL BOTTOM. INSTALL NEW LARGE ROCKS AS DIRECTED

SEE SHEET 4 FOR PROFILE

RESTRICTION AREAS PREBLE'S HABITAT (SEE NOTE 4)

DO NOT DISTURB

SATURATED AREA IN SPRING 2007 DUE TO SEEP NO. 4

BEGINNING OF GRAVEL DRAIN TROUGH IS APPROXIMATE AND WILL BE STAKED BY ROCKY FLATS PERSONNEL PRIOR TO CONSTRUCTION

SATURATED AREA IN SPRING 2007 DUE TO SEEP NO. 7

CONSTRUCT GRAVEL DRAIN TROUGH IN DIVERSION BERM 3 INVERT (SEE DETAIL 4)

FILL AROUND EXISTING LARGE ROCKS IN CHANNEL BOTTOM. INSTALL NEW LARGE ROCKS AS DIRECTED

CONSTRUCT 2 FT. X 2 FT. DRAIN WITH 1 1/2" DRAIN ROCK WRAPPED IN NON-WOVEN GEOTEXTILE. (SEE DETAILS 6 & 7)

SPREAD DRAIN TO 10 FT. WIDE AT STATION 6+50 (APPROX.) AND DAYLIGHT TO WEST PERIMETER CHANNEL DOWNSTREAM OF FILL AREA. (SEE DETAIL 7)

LEGEND:

- DITCH/CHANNEL/CREEK
- ROAD
- Tt-1● INCLINOMETER LOCATION
- RESTRICTION AREAS – PREBLE'S HABITAT
- GRAVEL DRAIN TROUGH ALIGNMENT
- C◆ SETTLEMENT MONUMENT

M:\LTS\111\0056\07\0010\S04677\S0467700.DWG 10/27/08 3:60pm whitney

NOTES:

1) CONSTRUCTION ACTIVITIES IN THIS CONTRACT WILL BE LIMITED TO THE WEST PERIMETER CHANNEL AND DIVERSION BERM NO. 3.
2) SURFACE CONTOURS BASED ON TOPOGRAPHIC SURVEY BY FLATIRONS, INC. IN JULY 2008.
3) DO NOT DISTURB INCLINOMETERS, MONITORING WELLS AND SETTLEMENT MONUMENTS.
4) DO NOT CONDUCT CONSTRUCTION ACTIVITIES SOUTH OF PREBLE'S HABITAT BOUNDARY LINE.
5) BOUNDARY OF SIDE SLOPE DRAINAGE AREA IS APPROXIMATE. ROCKY FLATS PERSONNEL TO STAKE AREA PRIOR TO CONSTRUCTION.

WEST PERIMETER CHANNEL PLAN VIEW

SCALE IN FEET
25 12.5 0 25 50 75
CONTOUR INTERVAL (WITHIN OLF) = ONE FOOT
CONTOUR INTERVAL (OUTSIDE OLF) = TWO FEET

N

REVISION NO.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	PROJECT A/E	APPROVAL

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AC01-02CL79491

PROJECT LOCATION
ORIGINAL LANDFILL
ROCKY FLATS SITE
GOLDEN, COLORADO

REFERENCE

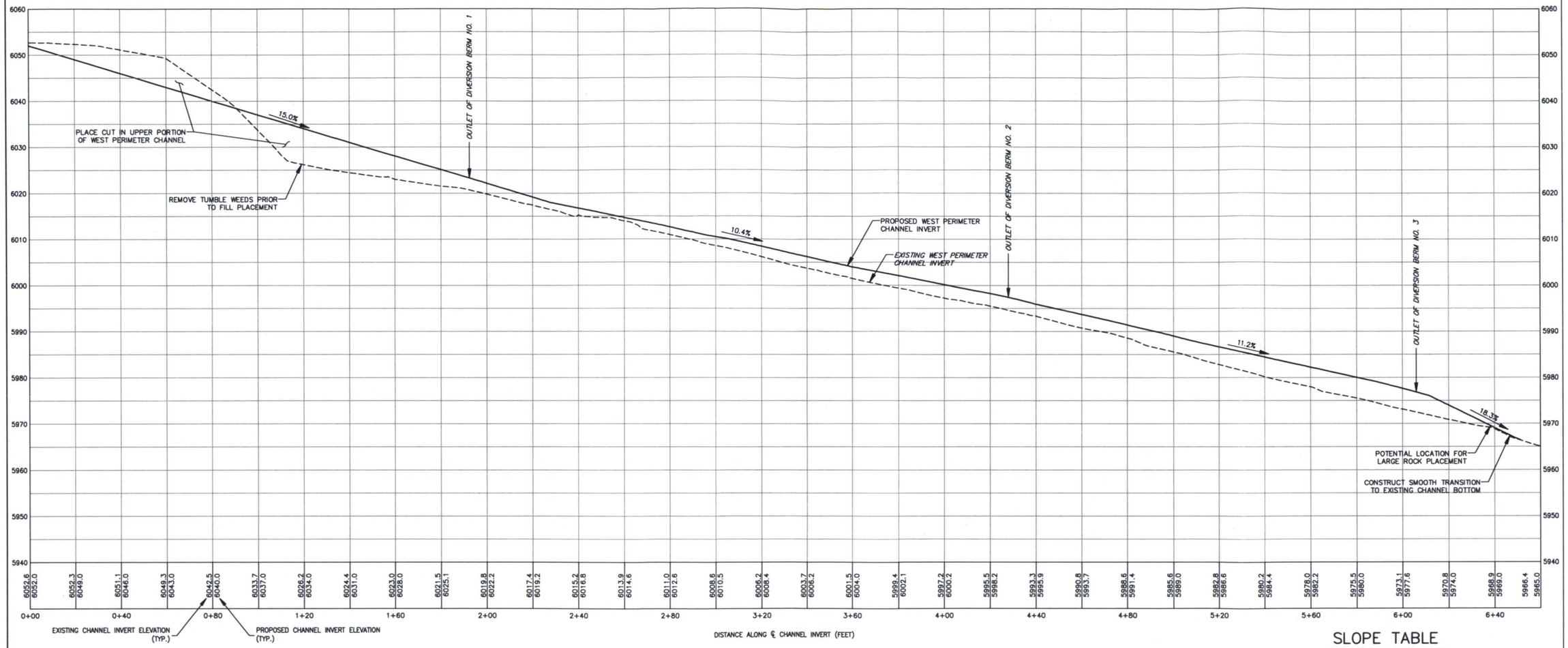
TETRA TECH

APPROVALS		
DESIGNED BY	T. BOEHLER	10/24/08
DRAWN BY	J. KIENHOLZ	10/24/08
PROJECT ENGINEER	S. Tasseff	10/24/08
APPROVED BY	D. NORDEEN	10/24/08
PROJECT MANAGER	L. KAISER	10/24/08
DOE CONCURRENCE	(SEE RECORD)	10/24/08

ORIGINAL LANDFILL
WEST PERIMETER CHANNEL STABILIZATION

GRADING PLAN

PROJECT NO. LTS-111-0056-07-001D
DRAWING NO. S04678-R00-C01-D+
SHT. 3 OF 6



SLOPE TABLE

STATION	SLOPE
0+00 – 2+28	15.0%
2+28 – 4+28	10.4%
4+28 – 6+06	11.2%
6+06 – 6+50	18.3%

WEST PERIMETER CHANNEL FLOWLINE PROFILE

SCALE IN FEET
20 10 0 20 40 60
VERTICAL EXAGGERATION = 2X

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REVISION NO.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	PROJECT A/E	APPROVAL

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AC01-02GJ79491

PROJECT LOCATION
ORIGINAL LANDFILL
ROCKY FLATS SITE
GOLDEN, COLORADO

REFERENCE

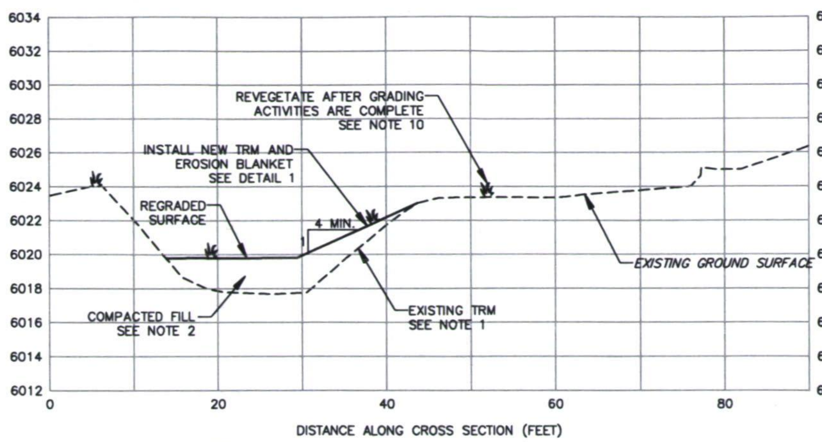
TETRA TECH

APPROVALS		
DRAWN BY	T. BOEHLER	10/24/08
ENGINEER	J. KIENHOLZ	10/24/08
PROJECT ENGINEER	S. THOMSEN	10/24/08
MANAGER	D. NORDEEN	10/24/08
PROJECT MANAGER	L. KAISER	10/24/08
DOE CONCURRENCE	(SEE RECORD)	10/24/08

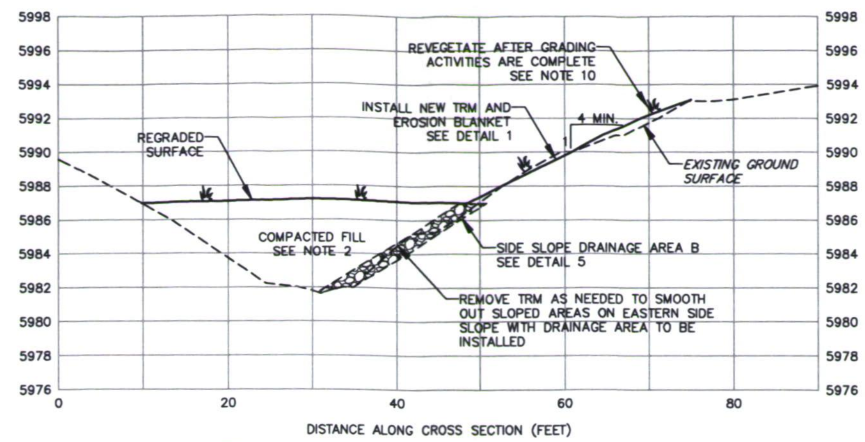
ORIGINAL LANDFILL
WEST PERIMETER CHANNEL STABILIZATION

PROFILE

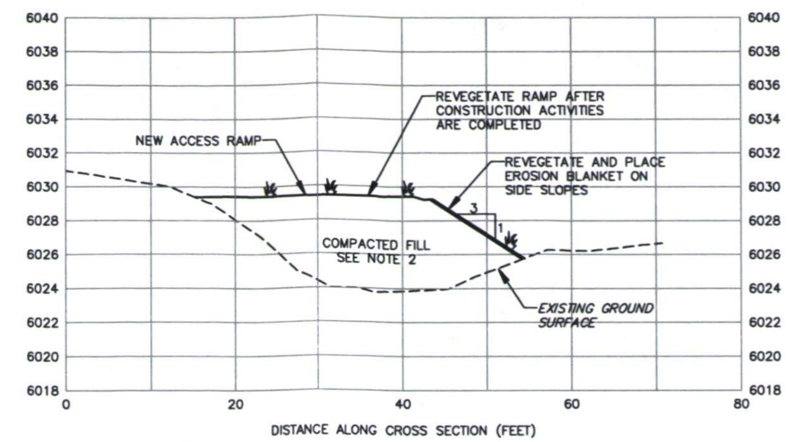
PROJECT NO. LTS-111-0056-07-001D
DRAWING NO. S04679-R00-P01-D+
SHT. 4 OF 6



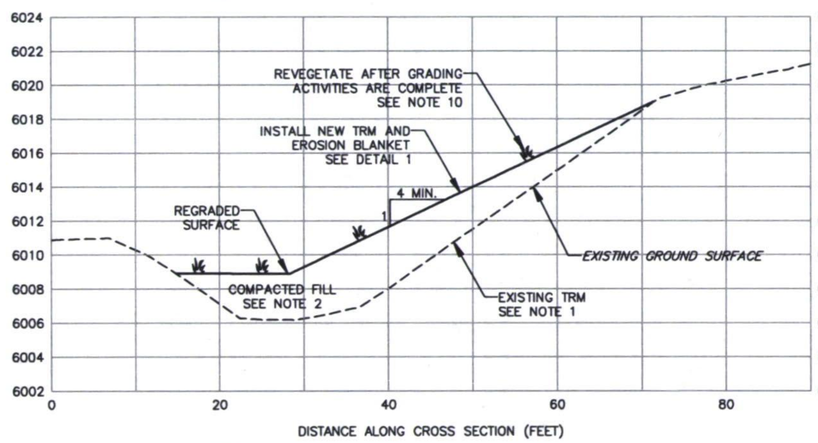
A 3|5 WEST PERIMETER CHANNEL



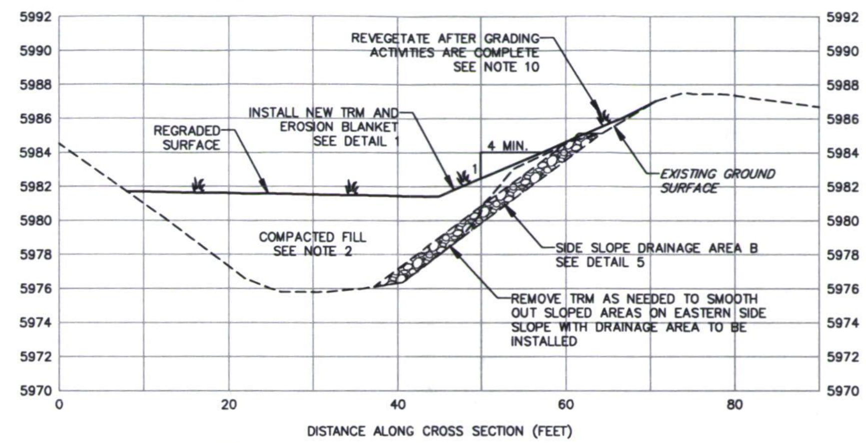
D 3|5 WEST PERIMETER CHANNEL



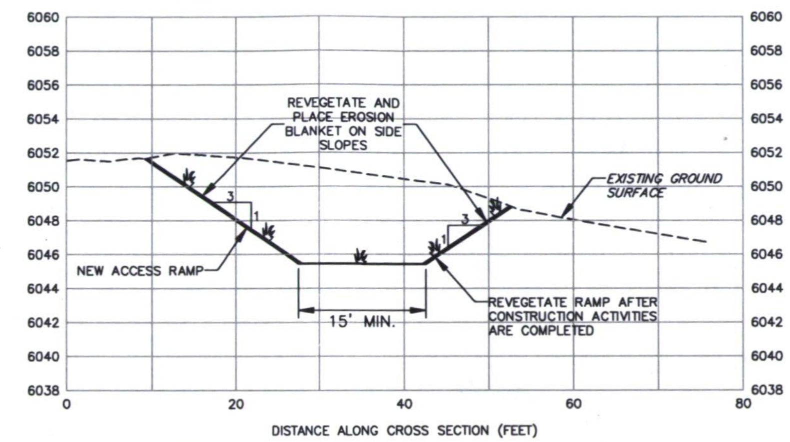
G 3|5 WEST PERIMETER CHANNEL



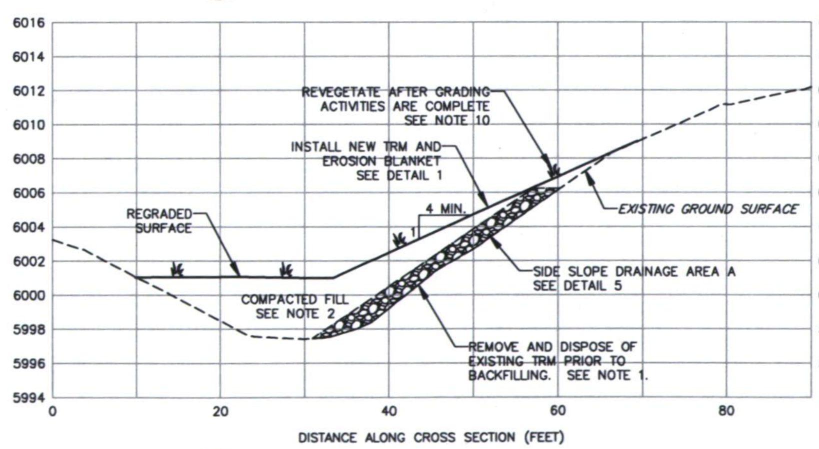
B 3|5 WEST PERIMETER CHANNEL



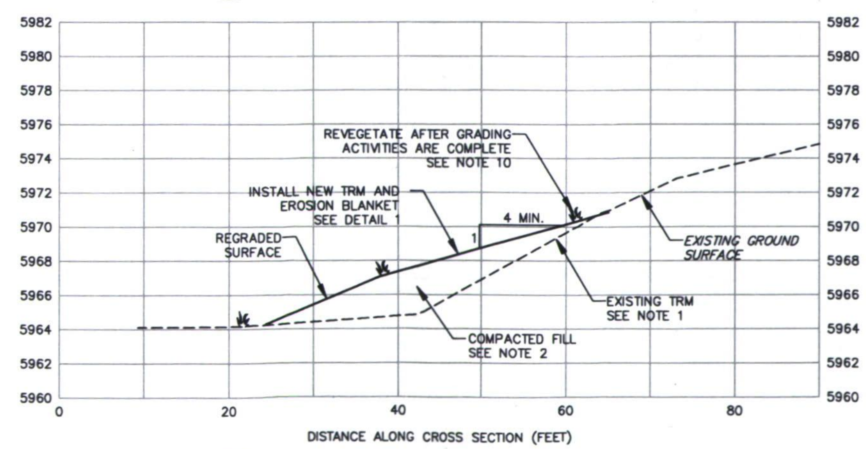
E 3|5 WEST PERIMETER CHANNEL



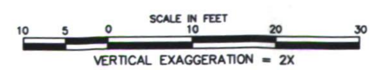
H 3|5 WEST PERIMETER CHANNEL



C 3|5 WEST PERIMETER CHANNEL



F 3|5 WEST PERIMETER CHANNEL



NOTES:

1) EXISTING TRM TO REMAIN IN PLACE EXCEPT IN AREAS REQUIRING DRAIN ROCK INSTALLATION. CUT TRM AND REMOVE PINS AS NECESSARY TO ENSURE PROPER BACKFILLING.
2) COMPACTION TO BE CONDUCTED BASED ON PERFORMANCE SPECIFICATIONS.
3) TO THE EXTENT PRACTICAL DO NOT DAMAGE EXISTING TRM.
4) GEOTEXTILE FOR USE IN THE DRAINAGE LAYER SHALL BE A NON-WOVEN POLYESTER OR POLYPROPYLENE MATERIAL, HAVING A MINIMUM WEIGHT OF SIX OUNCES PER SQUARE YARD (MARIFI● 160N OR APPROVED EQUAL).
5) DRAIN ROCK SHALL BE A POORLY-SORTED CLEAN GRAVEL, HAVING A MAXIMUM PARTICLE SIZE OF 1 1/2" AND NOT MORE THAN 5 PERCENT, BY WEIGHT, OF THE MATERIAL PASSING THE NO. 40 SIEVE.
6) OVERLAP EDGES OF NON-WOVEN GEOTEXTILE A MINIMUM OF TWO FEET OR SEW SEAMS TOGETHER WITH MANUFACTURER OR ENGINEER APPROVED METHOD TO COMPLETELY WRAP DRAIN ROCK.
7) ROUGHEN SURFACE PRIOR TO SEED APPLICATION. AFTER SEEDING, INSTALL TURF REINFORCEMENT MAT PER MANUFACTURER'S SPECIFICATIONS.
8) FOLLOW ROCKY FLATS HEALTH AND SAFETY PROCEDURES.
9) TURF REINFORCEMENT MAT SHALL BE NORTH AMERICAN GREEN, VMAX 550.
10) REVEGETATE DISTURBED AREAS PER PROJECT REVEGETATION SPECIFICATIONS.

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REVISION NO.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	PROJECT A/E	APPROVAL

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AC01-02GJ79491

PROJECT LOCATION: ORIGINAL LANDFILL ROCKY FLATS SITE GOLDEN, COLORADO

REFERENCE:

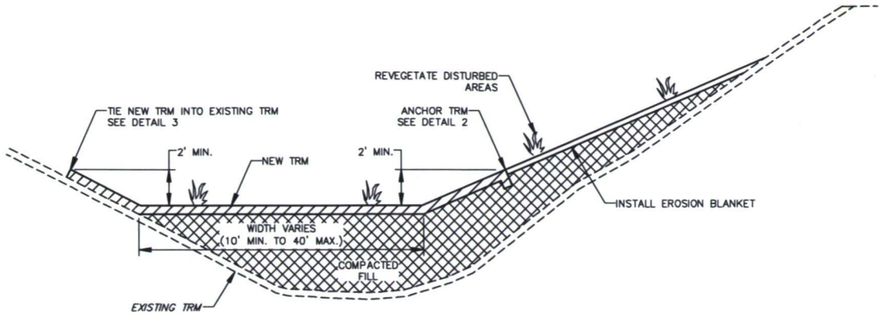
TETRA TECH

APPROVALS	DATE
DRAWN BY: T. BOEHLER	10/24/08
ENGINEER: J. KIENHOLZ	10/24/08
PROJECT ENGINEER: D. NORDEEN	10/24/08
APPROVED BY: D. NORDEEN	10/24/08
PROJECT MANAGER: L. KAISER	10/24/08
DOE CONCURRENCE: (SEE RECORD)	10/24/08

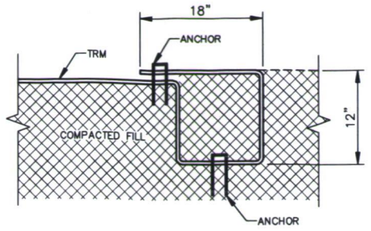
ORIGINAL LANDFILL
WEST PERIMETER CHANNEL STABILIZATION

SECTIONS

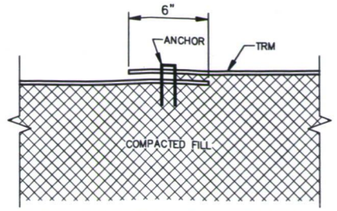
PROJECT NO. LTS-111-0056-07-001D
DRAWING NO. S04680-R00-C02-D+
SHT. 5 OF 6



1 / 5 6 WEST PERIMETER CHANNEL TRM PLACEMENT
NOT TO SCALE

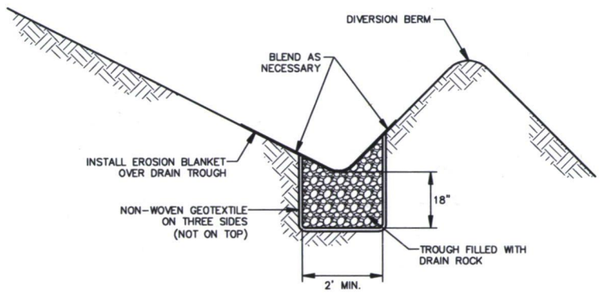


2 / 6 6 TRM ANCHOR DETAIL
NOT TO SCALE

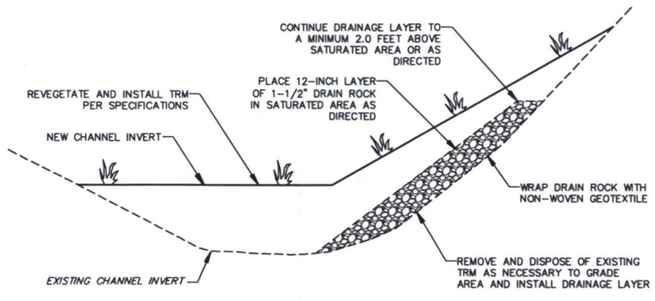


NOTE: INCREASE OVERLAP TO 12" AND DOUBLE THE PINS ALONG THE WEST SIDE OF THE CHANNEL FOR NEW TRM INTO EXISTING TRM.

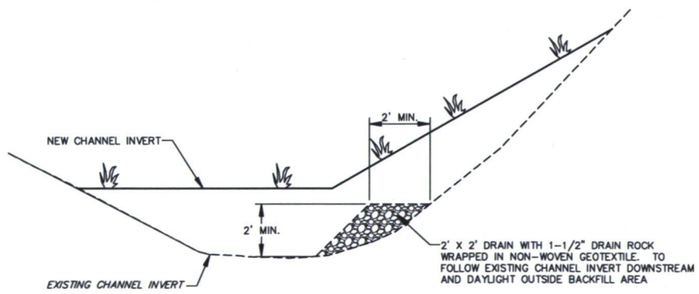
3 / 6 6 TRM OVERLAPPING DETAIL
NOT TO SCALE



4 / 3 6 DIVERSION BERM NO. 3 DRAIN TROUGH
NOT TO SCALE

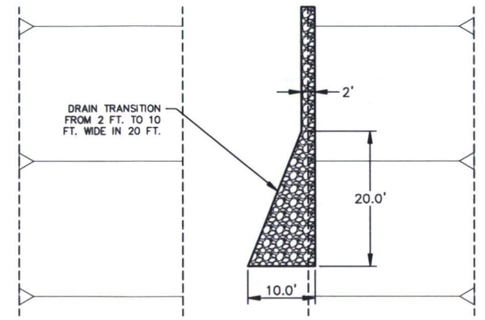


5 / 3,5 6 SIDE SLOPE DRAINAGE AREA B
NOT TO SCALE

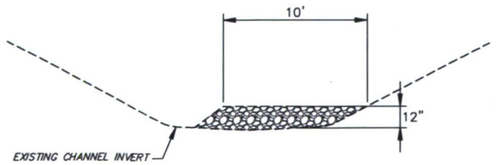


NOTE: SUBCONTRACTOR TO DISCUSS METHOD OF CONSTRUCTION TO CONTRACTOR PRIOR TO BEGINNING CONSTRUCTION ACTIVITIES.

6 / 3 6 DRAIN DETAIL
NOT TO SCALE



PLAN



SECTION

7 / 3 6 DRAIN DAYLIGHTING DETAIL
NOT TO SCALE

REVISION NO.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	PROJECT A/E	APPROVAL

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AC01-02GJ79491

PROJECT LOCATION:
ORIGINAL LANDFILL
ROCKY FLATS SITE
GOLDEN, COLORADO

REFERENCE

TETRA TECH

APPROVALS		
DESIGNED BY	T. BOEHLER	10/24/08
DRAWN BY	J. KIENHOLZ	10/24/08
PROJECT ENGINEER	S. TORGESEN	10/24/08
APPROVED BY	D. NORDEEN	10/24/08
PROJECT MANAGER	L. KAISER	10/24/08
DOE CONCURRENCE	(SEE RECORD)	10/24/08

ORIGINAL LANDFILL
WEST PERIMETER CHANNEL STABILIZATION

DETAILS

PROJECT NO. LTS-111-0056-07-001D
SHT. 6 OF 6
DRAWING NO. S04681-R00-C03-D+

63/63

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